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**Rocketeers
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—page 73**



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Volume 110

SEPTEMBER 1958

Number 3

Address all communications to: 200 E. Ontario St., Chicago 11, Ill.

In This Issue...

These Rocketeers Play Safe	-	-	-	73
Owners Report on the Vauxhall	-	-	-	82
Treasure Hunt in Navajo Land	-	-	-	89
Festival of the Iron Men	-	-	-	105
Flying Hero of the Alps	-	-	-	124
"Grand Prix" of the Lawn-Mower Racers	-	-	-	130
How We'll Steer in Space	-	-	-	137
Improve Your Wing Shooting	-	-	-	146
Radio, TV and Electronics	-	-	-	152

For the Craftsman...

Coat and Boot Rack for Your Hall	-	-	-	157
The Merry-maker Snowmobile	-	-	-	160
Photocopying the Easy Way	-	-	-	166
How to Shape Trees	-	-	-	174
Showcase of Tools—Circular Saws	-	-	-	183
Lamps—Interior and Exterior	-	-	-	189

Regular Departments...

Do You Know This Old-Timer?				22
Detroit Listening Post	-	97	How Would You Do It!	180
Keeping Up With the Atom	-	100	On the Market	199
What's New for Your Home	-	142	Shopping for Tools	209
Solving Home Problems	-	170	Clinic for Homemakers	214

Turn to detailed index on page 66. Sources of additional information on items in this issue are shown on the Where-to-Find-It List, available without charge by writing the Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

Next Month...

HOMES AND AUTOMOBILES—two subjects close to the hearts of Popular Mechanics readers—will be highlighted in the October issue. Fifty pages, many in full color, will be devoted to everything in and around the house in the annual Home Section. A new PM home, designed by two top-notch West Coast architects, will be introduced . . . THE FIRST OF THE 1959 CARS will feature Buick, Cadillac, Oldsmobile and DeSoto with pages of photos

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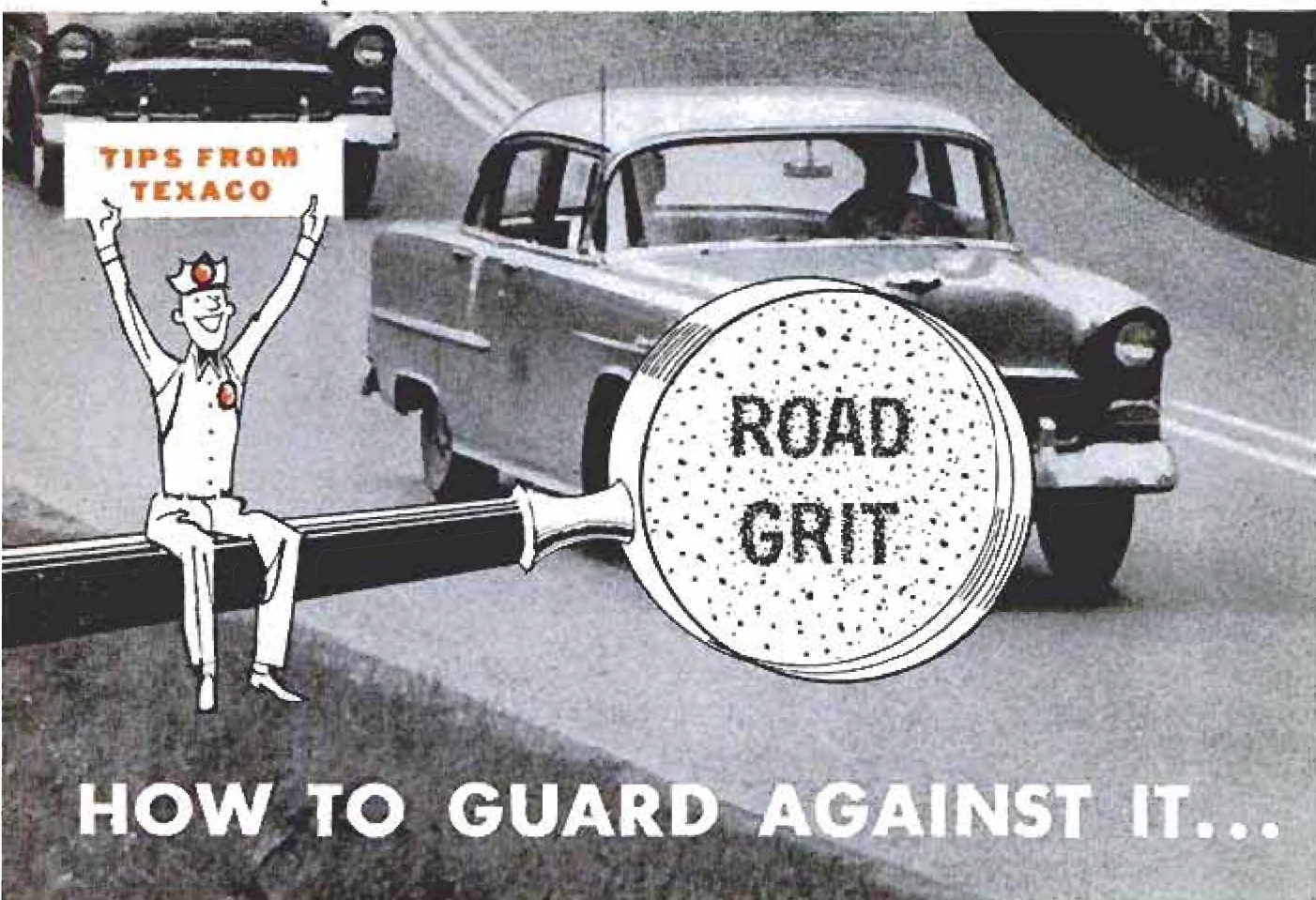
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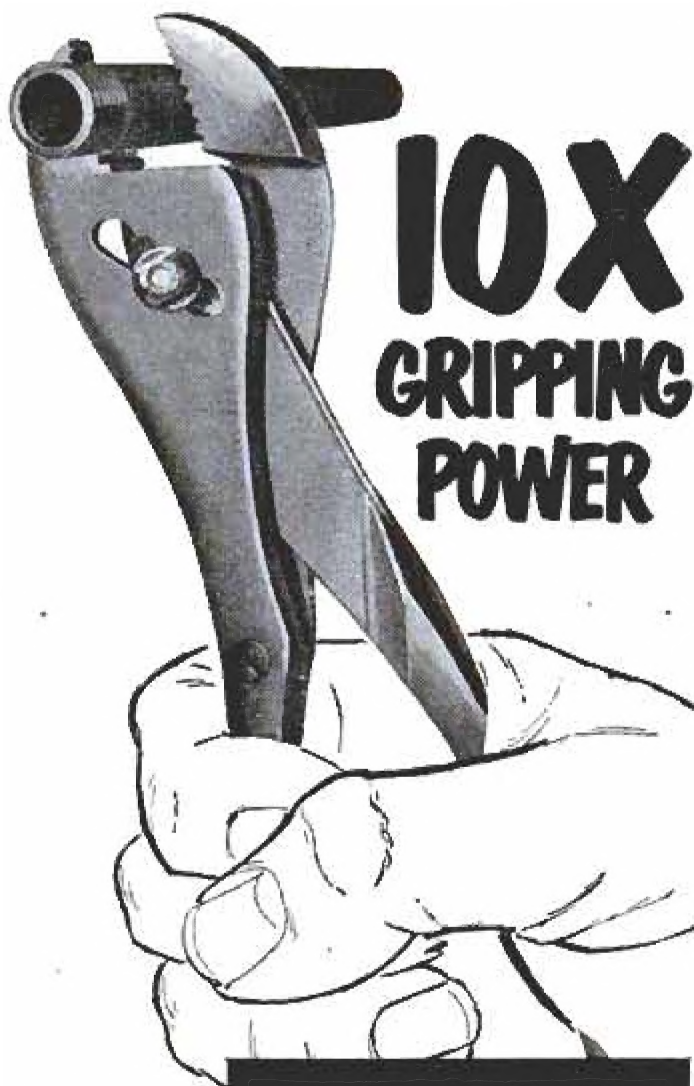
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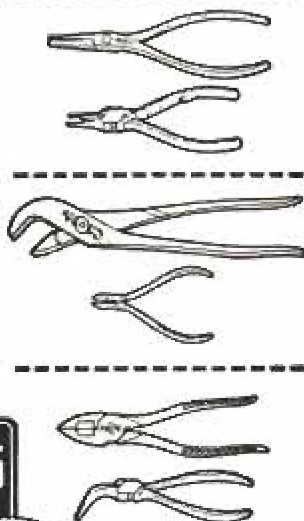


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To the Editor:

"School for Prospectors" in the June issue of *Popular Mechanics* interested me more than it would have generally, because it was read by me while looking over a large mineral deposit in the Selkirk Mountain Range of British Columbia.

The area this new find is in is really vast, and it is obvious that 90 percent of the mountainous terrain here has never been seen by man. What this part of the country needs is more hardy prospectors; in the valley where we made our discovery minerals abound, but there are no foot trails and one does well to cover from eight to ten miles in one day's walking. One hundred prospectors could not go over 25 miles of this valley in one year.

I find few men willing to walk any great distance these days; unless they can sit and ride, the trip is off.

In closing I would mention that, like many others, I have always appreciated your fine magazine and hope that you will keep it just about as it is. Articles similar to "School for Prospectors" will be especially appreciated.

L. C. de Kock,
Nelson, B. C., Can.

☆ ☆ ☆

To the Editor:

On page 12 of July's *Popular Mechanics* you had a picture of a car taken on a by-road (of) Chelan National Forest, Washington. ["Do You Know This Old Timer?"]

The man in the back is my father. He passed away 20 years ago. You can imagine the surprise I got seeing that picture; I thought you would like to know even



(Continued to page 8)

Satisfied with my PRESENT PAYCHECK? **NOT ME!!**

TODAY, you are probably earning enough to get by—enough to provide your family with life's necessities, and perhaps you are depositing a few extra dollars in the bank.

BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." **THAT'S WISHFUL THINKING!**

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DO YOU QUESTION YOUR OWN ABILITY?

There is a field of business which has never been overcrowded—it's the **ACCOUNTING FIELD**. And the demand for skilled accountants—men and women who really know their business—is increasing. State and Federal legislation requires much more efficient accounting from business. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, and Federal Income Tax. Men who prove their qualifications in this important branch of business are promoted to responsible executive positions—given an opportunity to earn real salaries. The range is \$5,000 to \$10,000 a year—even to higher income figures.

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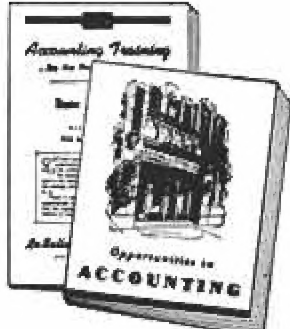
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(Continued from page 6)

women read your magazine. My father's name was Charles Howard; he lived in Tacoma, Wash. I will treasure that picture as long as I live. He always had a Dodge car as far back as I can remember. Thanks for printing it.

Mrs. Florence Rudder,
Bristol, Pa.

☆ ☆ ☆

To the Editor:

This Squadron of Civil Air Patrol, Inc., USAF Auxiliary (nonprofit), is blazing the way in Civil Air Patrol and civilian fields with survival training. We have recently undergone an instructor's course in survival under the supervision of Air Force personnel, of Forbes Air Force Base, Topeka, Kansas. In the past several months, we have made field trips for training purposes and have passed the knowledge gained from this experience along to others through CAP and CD Channels as well as directly to the public through displays and talks at public meetings. This training is now required in CAP.

In your January 1956 issue of *Popular Mechanics*, you ran an article entitled "Stay Alive in the Great Outdoors." Although this article is basically for the "week-end explorer," it fits well into sur-

vival anywhere and is soundly based to be used as a guide for emergency survival training since survival is always an emergency and common sense is the only solution. We would like your permission to reproduce the article in whole or in part for use in our work.

FOR THE COMMANDING OFFICER:

Charles R. H. White, 2/Lt.,
Supply Officer,
Civil Air Patrol,
Topeka, Kans.

☆ ☆ ☆

To the Editor:

While going through your magazine, as I do monthly, on page 137 of your April 1958 edition there is an article on "Sportsman's Cabin." This cabin is exactly what I need for an addition to my home in Norris City, Ill., as I bought a home for my sister, and for the size family she has the present house is not large enough. . . . This cabin would more than fill her needs.

Can you tell me what company manufactures and sells this cabin or forward this letter to them?

You might be interested to know that your particular magazine is one of the top ten most widely read, discussed and followed in our section here in Korea and I

(Continued to page 10)



Salvage expert with a tough hair problem. Dick Audler of New Orleans "works" under water. Sun, salt air and his helmet punish his hair.



He licks it with Vitalis. Vitalis keeps Dick's hair in condition. His hair never has a greasy look because Vitalis grooms with greaseless V-7.

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BIG JOB BOOM FORECAST!

Can You Get Ready in Time?

Right now job opportunities are tight all along the line. Economists now predict a period of mild ups and downs. Look for the "big break" to come in the next three years, they say. That's when good jobs will open up as never before. And men who are preparing themselves *now* will ride the crest of the boom.

DARK OUTLOOK FOR UNSKILLED WORKERS

Those with little or no training will find the going tough. Fewer openings. More competition for existing jobs. The tide is against the unskilled worker. It's getting stronger. Nor will the boom help. The new opportunities will go first to the skilled, next to the semi-skilled.

BIGGEST DEMAND IN THESE FIELDS

What's ahead? According to the best estimates, here are the industries due for the sharpest employment rise: Heavy transportation equipment. Mechanical, electrical, chemical, aeronautical and highway engineering. Industrial electronics.

All metals. Business services. Natural gas and oil. Paper products. On the other end of the scale, employment may lag in agriculture and leather. Check the trends in *your* field. Are you prepared to switch, if necessary?

GETTING YOURSELF READY—NOW

All the experts agree: Education, skill, specialized training will net the greatest rewards in the coming boom. The time you spend improving yourself is perhaps the wisest investment you can make *right now*. Your future success and happiness could hinge on your mastering a certain subject or acquiring a special skill. But there are obstacles. You may have a family to support. Or a job to hold down. You may feel you're too old to learn.

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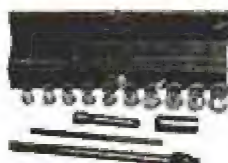


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(Continued from page 8)

imagine in most all other sections. You would be surprised how many ideas we get from this magazine that can be and are used right here in Korea.

M/Sgt. William Hoskins,
HQ., 314th Air Division.

Ed's NOTE: *Greetings to Sgt. Hoskins around the world in Korea. We're glad his mind is turning to a home in Illinois, and that we could be the agent in finding what he wants.*

☆☆☆

To the Editor:

In Oconomowoc, Wis., the Cooney-Customs hot-rod club has an unusual public-service project—that of providing free engraving service for automobile owners who want their hub caps inscribed with their auto serial numbers.

Members of the hot-rod club do this for



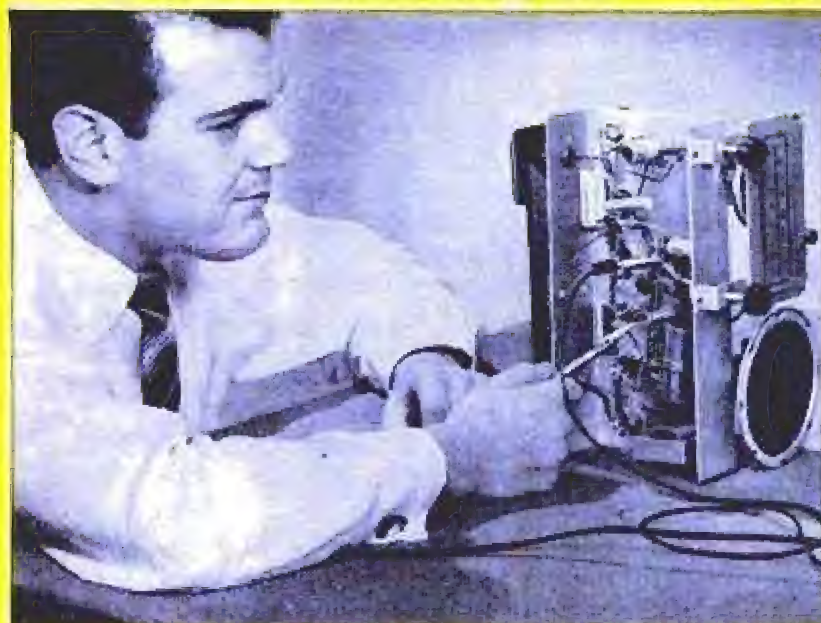
interested motorists at a local filling station. It is being done with the encouragement of the local police, as putting serial numbers on the hub caps will aid identification in case the caps are stolen. ("Cooney" is the nickname for Oconomowoc.)

Robert J. Higgins,
Oconomowoc, Wis.

Business Opportunities

Small businesses interested in obtaining information in regard to privately and government-owned inventions available for manufacture through purchase, licensing or other arrangements should write to the Production Assistance Division, Small Business Administration, Washington 25, D. C. This division sends out a Products List Circular on request every month.

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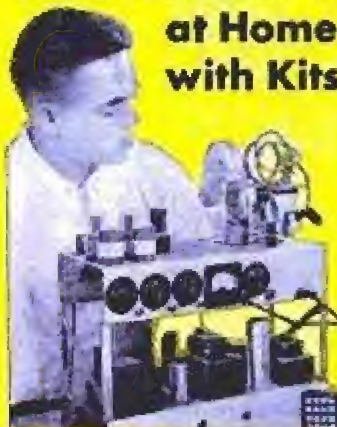
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We're Not a Gadget Shop, Says the Patent Office

EDITORIAL DEPT., WASHINGTON STAR

By Irving F. Lash

1174 4 PENN. AVE., WASHINGTON, D.C.

Many years ago some unsung genius invented a gun that fired square bullets to dispose of heathens and round ones to eliminate Christians. Exactly what he had in mind is problematical. Perhaps he intended to make his weapon available to both sides in holy wars. At any rate, the U. S. Patent Office granted the inventor a patent. Regulations governing the issuance of patents were not always as rigid as they are today. Even so, the patent examiner who gave this bizarre invention his and Uncle Sam's stamp of approval likely acted with mental reservations. Unquestionably he fervently hoped the gun would not backfire—on the Patent Office, that is. There is no record that it had official repercussions. Indeed, history fails to note that the weapon was ever used by combatants, or that anybody even bought one.

But when Samuel Colt came along in 1835 with another weapon that was to play a major, if bloody, role in the winning of the West, there was something of a kick-back—a legal one, not the ordinary recoil. Colt's revolver, a six-shooter, plainly offered an immense advantage over the single-shot pistol then in vogue, or even the double-barreled derringer of shorter range. In the hands of men adept with firearms, Colt's invention was visualized as a great timesaver in pushing back the pesky Indians and maintaining law and order in the wide-open towns that sprang up across the continent as pioneering, land-hungry Americans moved steadily westward.

Colt Is Immediate Success

Colt had no difficulty obtaining a patent, and his revolver almost immediately became a best-seller. It was a favorite among marshals and sheriffs and, unfortunately, among desperadoes as well. These latter, the gunslingers, professional killers, stage-coach robbers, etc., could buy a Colt as easily as a lawman and often times could use one better. This gave rise to public indignation when the lawless sometimes held sway with the very weapon intended to hold them in check.

The question was posed whether such an invention should be approved by the U. S. Government to the extent of its being patented. It became a federal court issue

(Continued to page 14)

INVENTORS

Learn how to protect your invention. The U. S. Patent Laws provide that any new and useful art, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof, may be patented if the act of invention is involved. Therefore, every inventor with a valuable invention should take advantage of the Patent Laws and proceed for patent protection in order to safeguard his rights.

A patent gives the inventor the exclusive right to prevent others from making, using, or selling the invention claimed in the patent for a period of seventeen years.

The Patent Laws were enacted for the benefit of the inventor to give him protection for the features of his invention which are patentable. These features must be properly and concisely set forth and claimed in a formal application for patent, in order to comply with the requirements of the Patent Laws. For that reason, unless the inventor is familiar with patent matters, he should engage a competent registered patent attorney or agent to represent him. We are registered to practice before the U. S. Patent Office and are prepared to serve you in the handling of your patent matters.

A specially prepared booklet entitled "Patent Guide for the Inventor", containing detailed information with respect to patent protection and procedure, together with a "Record of Invention" form will be promptly forwarded to you without obligation upon request.

CLARENCE A. O'BRIEN & HARVEY JACOBSON

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and was the subject of lengthy deliberations. The Patent Office for a while seemed on uncertain ground and the patent examiner who passed on Colt's weapon might have thought he was about to have his swivel chair shot from under him.

However, the court sustained the validity of the patent, and the reasoning behind the ruling in that case still applies to many other inventions considered of dubious value by skeptics and moralists. The decision, briefly, was that the Patent Office has no excuse to withhold a patent on an invention designed and adapted to produce a good result, even though the same invention, if it falls into the wrong hands, may be utilized to accomplish a bad result.

Not a Policing Agency

This ruling, cited at length in Walker on Patents, has stood the Patent Office in good stead. The public is sometimes under the impression that the Patent Office should act as a censoring agency, or keeper of the nation's morals. That isn't the case. An invention, patented with the best intentions, which afterward becomes a menace to the public, usually gets the attention of law-enforcement agencies. Fireworks are patented but their use is banned in many communities.

Recently a Washington citizen took of-

fense in the public prints at a gadget he resented. He had been reading a list of patents. Bear in mind that the Capital has its share of juvenile delinquency and street crimes, and anything that promotes same is disapproved by solid citizens. Some persons with an extremely dim view of small fry in general apparently feel that all of them are little monsters—the criminals of tomorrow, if they haven't already arrived. Anything that aids or abets their unsavory matriculation in the kindergarten of crime doesn't set well with the already harassed public.

Citizen Complains

So the disturbed citizen got off a letter to the editor of *The Washington Star*: "The Patent Office has just issued letters patent covering a toy knife with a bulb in its handle which, when pressed, releases a blood-red fluid as the knife point touches a 'playmate.' The patent description reads: 'Thus the user of the toy will derive additional pleasure from the realistic effect of the bleeding.'

"In this," he wrote, "the United States Government becomes an active partner in making available an unusually horrid instrument of juvenile delinquency. Does not the Commissioner of Patents have the

(Continued to page 16)

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discretion to refuse, in the public interest, the issuance of such a patent?"

It was a good question. The Patent Office was queried by *The Star*. At first the Patent Office spokesman appeared taken aback, but he quickly righted himself. "The Commissioner of Patents," he explained, "in granting or refusing patents is controlled by the patent statutes and by United States court decisions interpreting these statutes. The commissioner has no discretion to refuse a patent so long as the application upon which it is based contains a fair description of a device which is a new invention and is useful in some manner. The toy in question, while it could be misused, also could be useful as a stage prop. So long as an invention has proper and legitimate uses, the fact that it may be used illegally or immorally is not sufficient ground to refuse patent protection."

Gadgets Make News

It is usually what the Patent Office calls "frivolous" types of inventions that catch the eye and lead to disputes about their usefulness. Likewise it gives some readers the idea that the Patent Office is more of a novelty shop than anything else. Gadgets make better copy than cumbersome inventions of much greater value, and thus newspapers and magazines are sometimes inclined to play up frivolous inventions.

This is a tender spot with the Patent Office, which prefers to emphasize its major contributions to the American way of life. But the Patent Office just can't seem to get people to play down gadgets. The Secretary of Commerce himself once unwittingly furthered the misconception that this important agency under his wing is more concerned with patenting items of relative insignificance than it is with weightier matters affecting the Nation's commerce. Not long ago, the Secretary, in making a speech about the great things done by the Patent Office, said: "And just think, only yesterday the Patent Office issued a patent on a new chewing gum guaranteed not to stick to false teeth."

Business With Men of Science

The Patent Office would rather talk about the big men in science it has done business with, like Thomas Edison, Alexander Graham Bell, Eli Whitney, Cyrus McCormick, Samuel Morse, Robert Fulton and other laboratory greats whose names are known to schoolboys.

They would prefer to discuss the talents of Thomas Jefferson, inventor par excellence, who headed the Nation's first patent committee after President George Wash-

(Continued to page 18)

INVENTORS

If you believe that you have an invention, you should find out how to protect it. The first step is to have a search made of the prior pertinent U. S. patents. If a report on this search indicates that the invention appears patentable you can apply for a patent, and the specifications and claims should be prepared.

The firm of McMorrow, Berman & Davidson, with offices in Washington, D. C., is qualified to take the necessary steps for you. We can make a preliminary search on your invention, advise you whether we think it can be patented, and prepare your application for patent.

Unless you are fully familiar with the U. S. Patent Laws, we recommend that you engage the services of a Registered Patent Attorney to protect your interests. The patent laws are *your* laws. A patent gives you the right to prevent others from making, using or selling the invention claimed in your patent for a period of 17 years.

Use these patent laws for your protection. Investigate whether your invention can be patented. If you have what you believe to be an invention, we suggest that you have this firm make a search for you.

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ington, on April 10, 1790, signed the act of Congress that gave birth to the American patent system. Incidentally, the first patent known to have been issued by the United States turned up a few years ago in a trunk full of old papers given to the Chicago Historical Society. Signed by Washington and Jefferson, then Secretary of State, it was a patent for an improvement in the process of making potash. Jefferson took patent applications home from the office, to look them over and decide whether they were something new and patentable.

America Still Needs Inventors

Just as America needed inventors in its formative days, so does it need them now. The National Inventors Council, formed in Washington in 1940 by the Secretary of Commerce as a link between the inventive public and the armed forces, welcomes civilian inventions which can be helpful to the military—anything from dehydrated meats to portable death rays.

While Government-sponsored research contributes much toward America's ability to stay abreast or ahead in the arms race, most revolutionary inventions of war have been the ideas of civilians operating independently. Besides Sam Colt's six-shooter, which the Army was glad to get, Eli Whitney, while better known for his cotton gin, invented the first rifle with interchangeable parts. Garand, another thinker in mufti, came up with the famed M-1 rifle. Still other civilians are credited with inventing the screw propeller, smokeless powder and the torpedo.

Dr. Charles F. Kettering, of General Motors, is chairman of the National Inventors Council. He has a few notable inventions to his own credit—such as the self-starter and an auto ignition system, appropriately developed in a barn.

John C. Green, the council's executive director, as well as director of the Office of Technical Services, said recently the Government "isn't getting one third of the ideas that it needs from the general public."

Army, Too, Wants Inventions

By way of encouraging civilians to submit ideas, the council last year brought up to date a list of 300 technical problems faced by the military. The list includes things which the Army would like somebody to invent. The council will mail it to anyone who asks for it.

Some of the sought-after inventions are a photographic film which will snap a high-speed picture by moonlight; a chemical to harden earth to the consistency of concrete, and a nonmagnetic compass for foot

(Continued to page 20)

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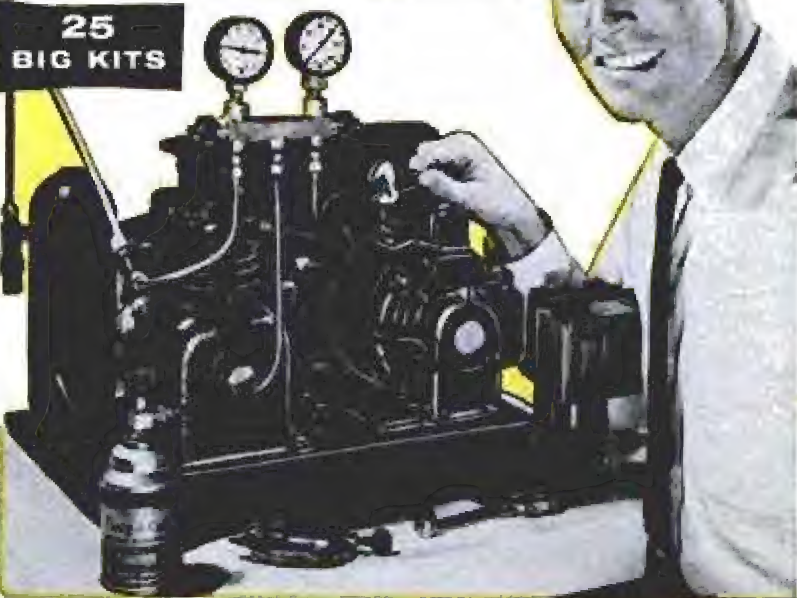


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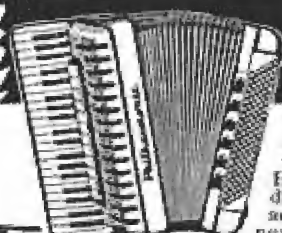
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soldiers who carry metal-laden equipment. The council is willing to examine plans or blueprints for any invention, no matter how fantastic, but it is a bit gunshy on accepting chemicals. It drew the line here after one inventor mailed in a bomb containing itching powder. It was so effective that the men who unpacked it at the Commerce Department were scratching for a long time thereafter.

Newspaper headlines frequently inspire inventions and many ideas for them. Following a series of air crashes, there are always new ideas or plans for instruments to make flying safer. When Germany was bombing Britain from the air during World War II, hundreds of ideas were advanced for detecting invading planes. When German subs were blockading the Atlantic Coast, many inventors submitted plans for warding off or neutralizing torpedoes.

The Government is not alone in encouraging inventors. Private industry often has problems that baffle its own technicians and appeals to brainy ones outside to help. A Newport, Ark., metals company which manufactures 200 million toothpaste tubes each year, sometime ago offered \$5000 to the person who could invent a toothpaste cap that couldn't get lost. Apparently, the company found, that idea was just as elusive as the cap itself. ★ ★ ★

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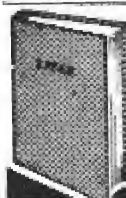
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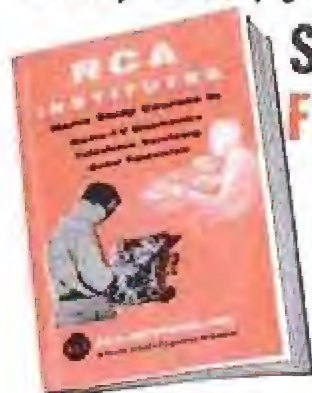
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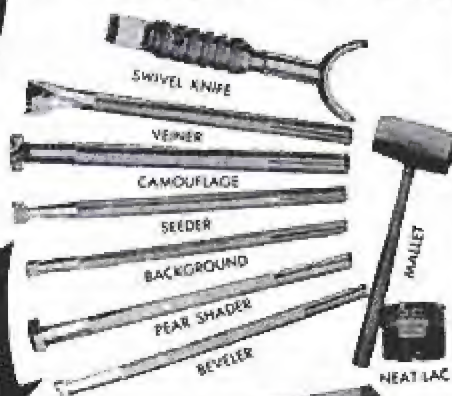
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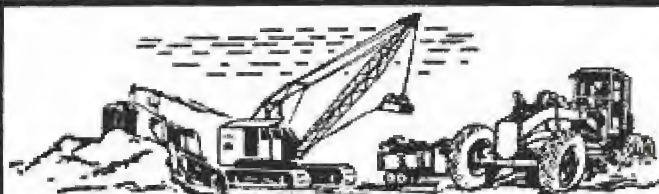
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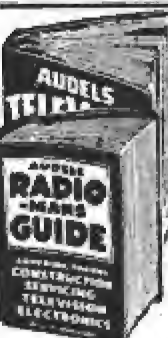
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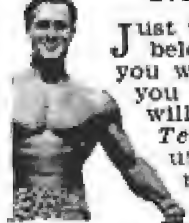
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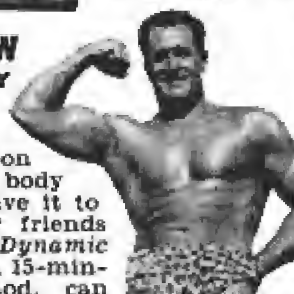
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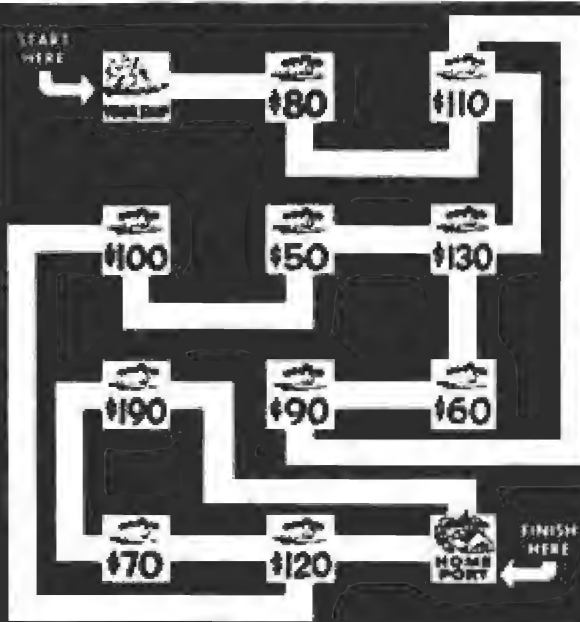
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1. HOW TO ENTER Send in your solution on the Entry Coupon below. First trace out a route from "Your Ship" to "Home Port" on the puzzle diagram. Trace your route only along white ship lanes (from island to island). Visit no island (white squares) more than once—and travel on no ship lane (white lines between islands) more than once! Collect all the treasure indicated on each island you visit. On coupon, list in the order you visited each island, the amount of treasure you found on each island plus the total amount of treasure you found! Collect no treasure from islands you did not visit!

2. PRIZES Contestants finding the most "treasure," in accordance with the official rules, will win the prizes, which will be awarded in order of relative scoring rank.

3. WHO MAY NOT ENTER This contest is closed to employees, agents, relatives, and others connected with this contest, including anyone who has won over \$500 in a puzzle contest prior to January 15, 1958. Please note there is only one Captain Pete Contest. Do not enter more than once.

4. **TIES** Ties are to be expected, in which event tied-for prizes will be reserved until ties are broken. Such tied contestants will compete in as many additional **FREE** puzzles as required to break ties, but not to exceed eight more, after which if ties still exist, duplicate prizes will be awarded. Tie-breakers will be similar to the entry puzzle but more difficult. Each tiebreaker puzzle will be required to be solved and judged only if ties still exist after the judging of the preceding puzzle. No payments or purchases of any kind will be required with tie-breaking submissions to compete for the \$1000 First Prize and the other prizes listed in the headline, including the Bonus Prize. At least 3 days will be allowed for the solution of each mailed tiebreaker. If necessary, tied contestants may be required to do one or more tie-breaking puzzles under supervision and without assistance in a 2-6 hour period per tiebreaker. Sponsor has right to make such luncheon rules as sponsor deems necessary for proper conduct of contest.

5. DATES Entries must be postmarked not later than Nov. 29, 1958. Everyone in the family may enter—but only one entry per person. Each entry must be accompanied by a stamped, self-addressed envelope. Entries NOT accompanied by a stamped, self-addressed envelope may be disqualified! You may draw by hand a facsimile of the Entry Coupon and use it to enter. Neatness does not count but illegible or incorrectly scored entries will be disqualified.

qualified. Sponsor has right to offer increased, additional or duplicate prizes. Contest subject to applicable State and Federal regulations.

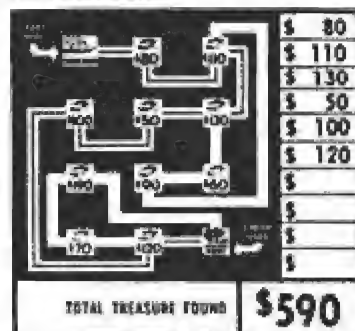
All submissions become property of sponsors. Judges' decisions final. Sponsors not responsible for lost or delayed mail or delivery thereof.

FREE money on deposit in bank.
HIGH SCORE for this puzzle will be mailed to each entrant within 10 DAYS of date entry is received. This **FREE ENTRY** Contest is sponsored by Ingram Lather Shaving Cream and Ingram Razor Blades. We hope that you enjoy this contest and that the next time you purchase Shaving Cream or Razor Blades you will ask for Ingram.

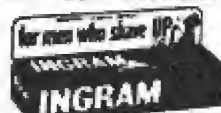
6. BONUS PRIZE Get someone else to enter this contest and you will receive a Bonus Prize of an extra \$500 cash if you win First Prize! To prove you were responsible for your friend or relative entering, have him print your name on the back of his or her Free Entry Coupon. He can make a facsimile (copy) of the entry coupon. Send in your Free Entry Coupon NOW—have him send in his Free Entry Coupon in a separate letter including his own stamped, self-addressed envelope.

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This Sample Solution shows you how to find \$590 by visiting only 6 islands. So you can see this is not a very good solution. To get the best solution you should visit as many islands as possible and collect as much "treasure" as possible. Now try the puzzle yourself!



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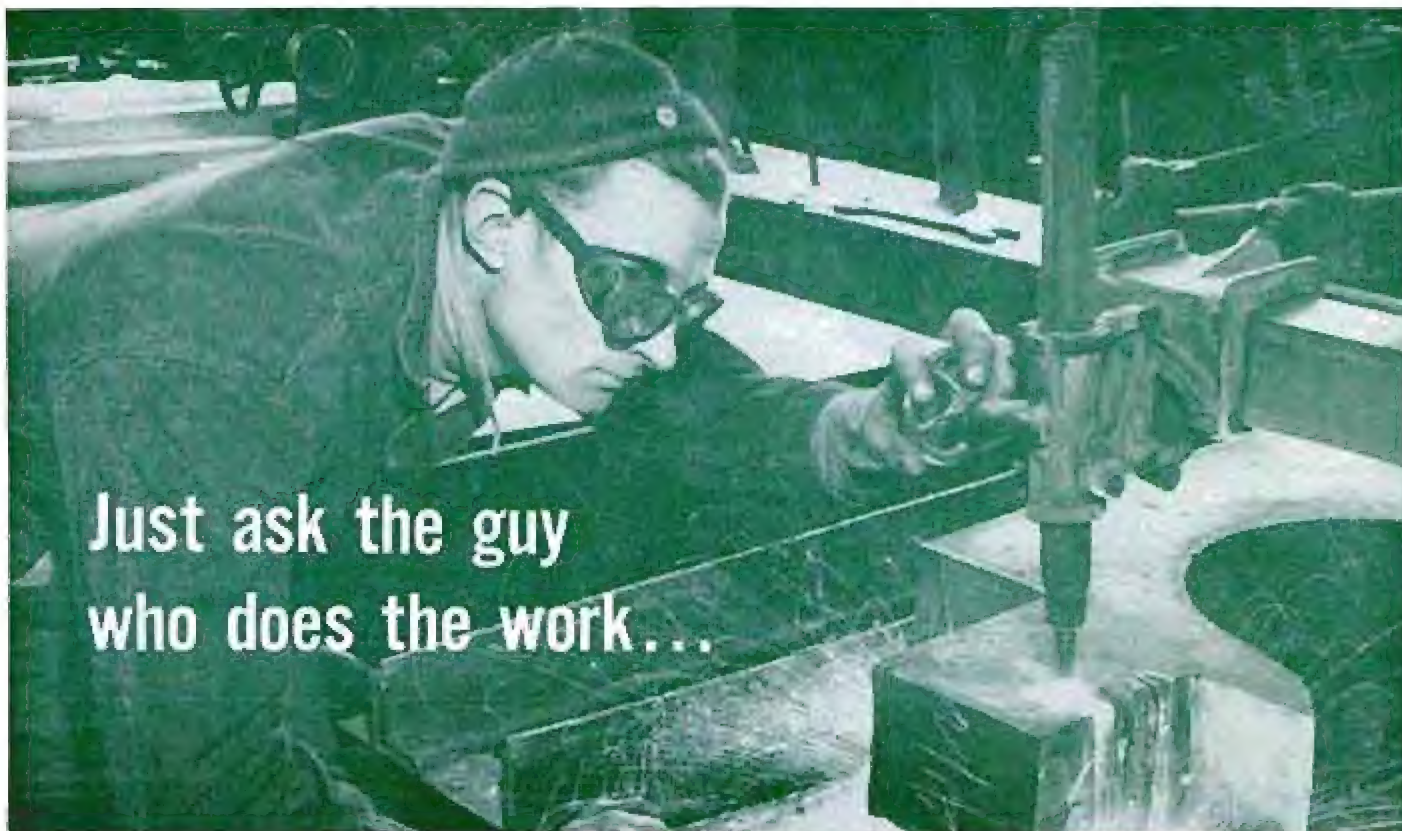
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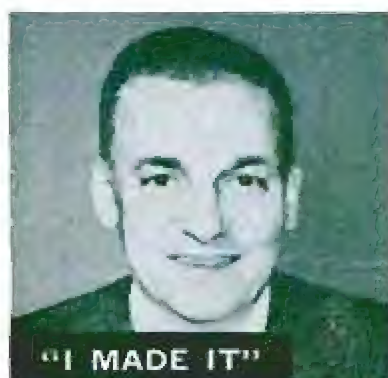


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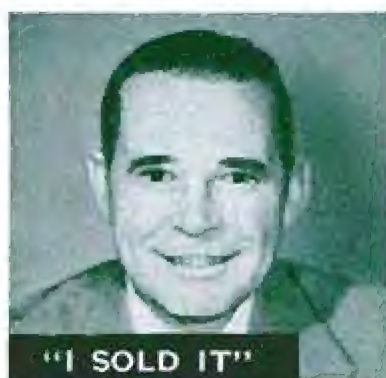
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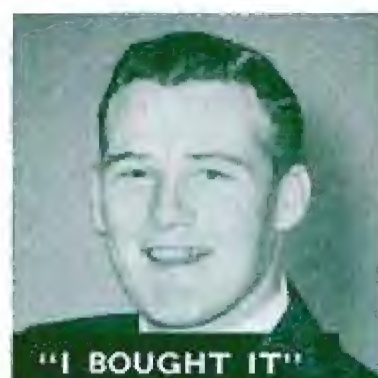
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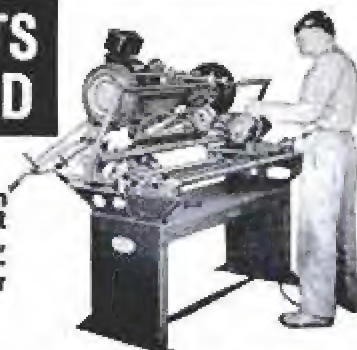
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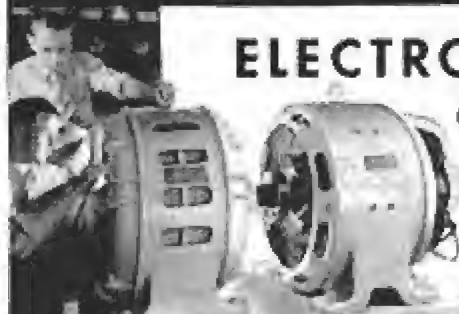
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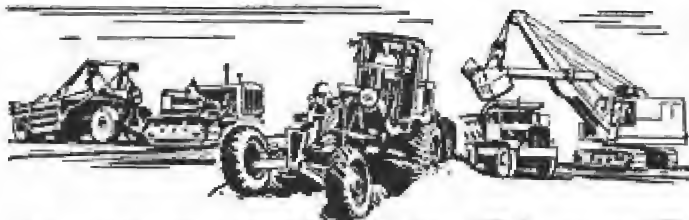
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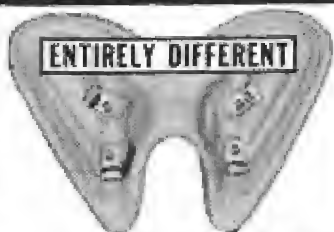
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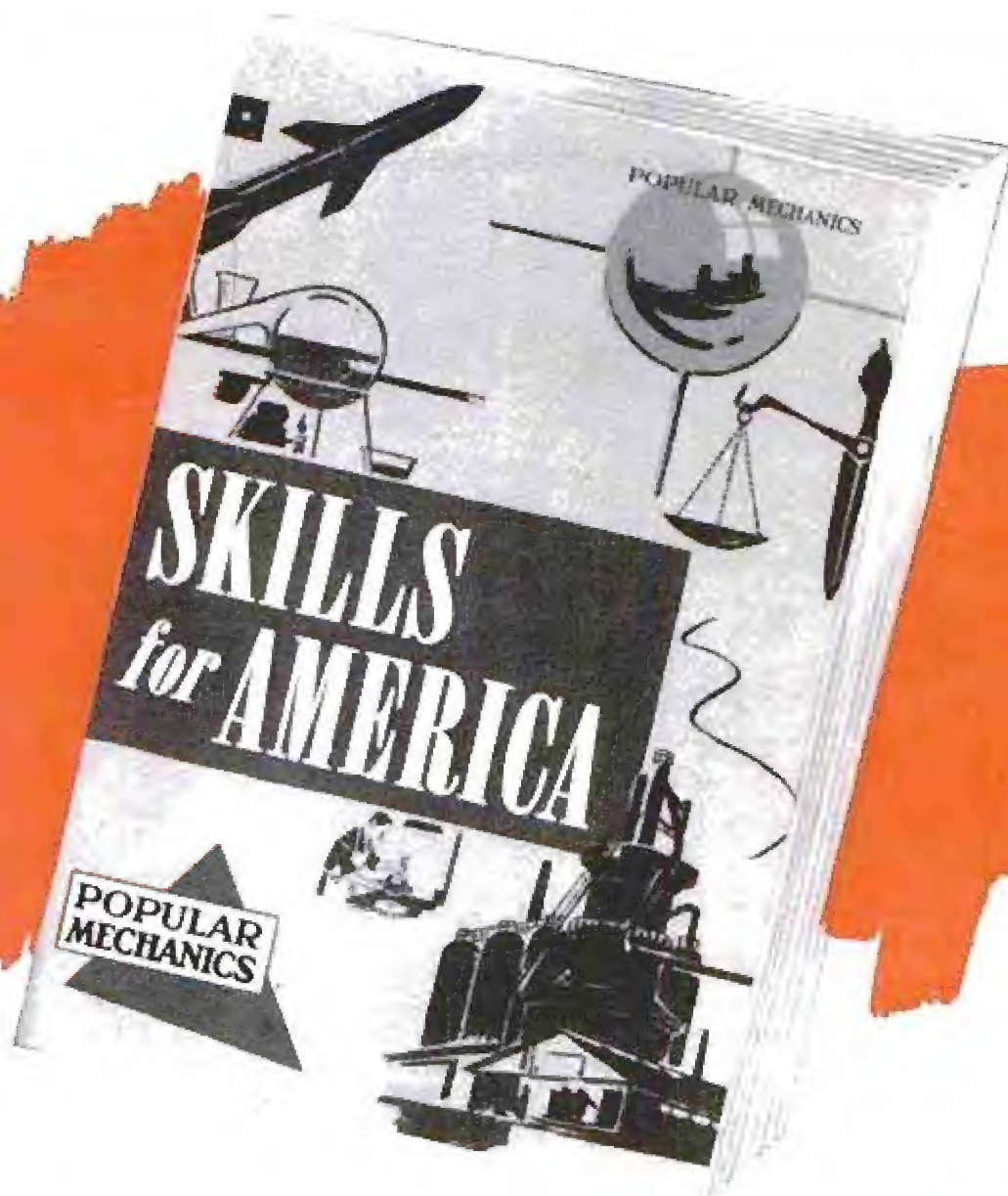


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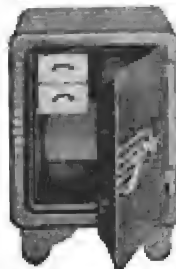
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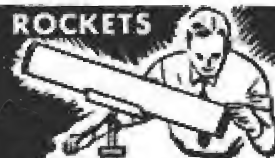
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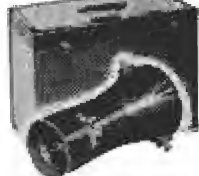
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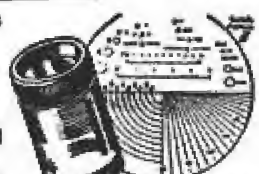
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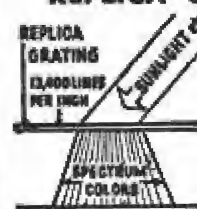
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MOVIE Camera film: 8mm. roll \$1.50, 16mm. 100' \$3.00. Free processing. Better Films, 742 New Lots, Brooklyn, N. Y.

SAVE 50%! Guaranteed-fresh color, b&w. movie film! 8mm., 16mm. Free catalog! Eco-R, 47th Holly, Kansas City 12, Missouri.

PROFESSIONAL Color movies Europe. Russia, America, Box 684, Meriden, Conn.

FREE Catalog. Save dollars. Fresh 8mm., 16mm. b&w and color film. Home processing equipment. Superior Bulk Film Company, 448 No. Wells, Chicago 10.

MUSIC AND MUSICAL INSTRUMENTS

1958 ACCORDIONS Wholesale—10 day trial. Free catalog. American Accordion Center, 5329 PM-9 Belmont, Chicago.

COMPOSE Beautiful melodies quickly, correctly harmonized, without previous musical training. Guaranteed. \$3. Tune-kit, Box 1813, Abilene, Texas.

POEMS Wanted for musical setting and recording by America's largest song studio. Send poems. Free examination. Five Star Music Masters, 630 Beacon Building, Boston.

ACCORDIONS! Lowest wholesale prices guaranteed. Save up to 75%. Free home trial. Trades accepted. Free color catalog. Accordion Manufacturers, Dept. 98-R, 2003 W. Chicago, Chicago 22.

RECORDS, Hi-Fi. Big discounts. Noel-son, Box 211, Wall Street, New York City 5.

SONGS And poems wanted. U. S. Music Studios, Box 222A, Belmont, Mass.

VIOLINMAKERS, Repairers. Fine tone wood, and all violin supplies. Send for free wholesale new price list. International Sales, 414-MPM E. Baltimore St., Baltimore 2, Maryland.

SONGWRITERS! Don't mail poems or songs anywhere! Write for safe procedure! Song Service P. 333 West 56th, New York City 19.

WANTED! Poems, lyrics, songs, ideas. Bengol, 93 Jefferson, Chelsea 50, Mass.

SWISS Musical movements, \$1.90. Helax, 218 W. 72nd St., New York City 23.

VIOLIN Makers supplies. Free catalog. 308 W. Fourth, Los Angeles 13.

ACCORDIONS, Wholesale to everyone. Save up to 60%. All national known brands. Free catalogue. Del Principe, 29 South Cicero, Chicago 44.

WRITE Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 4700 South California Avenue, Chicago.

SONGS Into dollars. Share \$33 million dollars yearly for new songwriters, song poets. Any subject, songs composed, published, promoted by largest firm. Information, appraisal free. Send Nordyke Music Publishers, 6000 Sunset, Hollywood 28 PM, California.

SONGPOEMS And lyrics wanted. Mail to: TinPan Alley, Inc., 1650 Broadway, New York 10, N. Y.

POEMS Wanted for new songs and recording. Immediate consideration. Send poems. Songcrafters, Box 6145, Acklen Station, Nashville, Tenn.

YOUR Songs arranged and recorded for publisher's presentation. For information write: Vance Studios, 3409 Grand Ave., Oakland, Calif.

POEMS Wanted for new songs. Send poems. Immediate consideration. Crown Music Company, 49-C West 32 Street, New York City.

ELECTRIC Guitars, amplifiers, whole-sale. Free catalog. Carvin FMM, Covina, California.

FREE Demonstration records. Complete music service for songwriters. Jerry Colonna, Box 888M, Burbank, Calif.

SONGS Needed for new record label. Olenk Records, Mount Morris, Michigan.

FREE Wholesale musical instrument catalog. Complete lines of instruments and accessories. Nationally famous brands. Strauss Music Company, Clifton 70, New Jersey.

RADIO, TELEVISION AND ELECTRONICS

KITS \$2.98 Each. Resistance box, capacitance box, tube checker. Special! Order 2, get one free. Includes instructions, new parts, surplus case. Free flyer on request. Alkit, Box 98, Midwood Station, Brooklyn 30, N. Y.

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RADIO Course only \$22.95. Includes all tubes, parts, tools, instructions. Write for full information. Progressive "Edu-Kits" Inc., Dept. 558B, 1186 Broadway, Hewlett, N. Y.

CRYSTAL Radio builders, write Hulet, 305 Hope, Lakewood, New Jersey.

RECORDERS, Hi-Fi. Free wholesale catalogue. Carston, 215-PM East 88, New York City 28.

FREE! Giant bargain catalog. Transistor, "Sun" radios, kits, portables, audio, electronics, photographic, optics, tools, household. Write Lektron, 131M Everett Ave., Chelsea, Mass.

TAPE Recorders, hi fi components, tapes. Unusual values. Free catalog. Dressner, 69-02M 174 St., Flushing 65, N. Y.

SIMPLE Television repairs. Marvelous booklet or book. Send for 1958 book catalog—10¢. Popular Mechanics Press, 633 N. St. Clair St., Chicago 11.

ELECTRIC Guitars, amplifiers, wholesale. Free catalog. Carvin, PMR, Covina, California.

CRYSTAL Radio kit \$1.00, preassembled \$1.25, phone \$1.75; catalogue. Clearco Crystal Company, 2966 North 4th, Milwaukee 12, Wisconsin.

PROLONG Battery life on your portable radio with converter-charger, only \$3.95. Delmeco Products, Box 1123, Wilmington 99, Del.

HEAR London, Moscow. Shortwave radio kit; complete, \$3.50. Alliance, 2059 60th, Brooklyn 4, N. Y.

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OPERATE Profitable mailorder business! Write: Bond, 1637-H West Vernon, Phoenix, Arizona.

\$400.00 MONTHLY Raising redworms, mealworms, crickets. Clean soilless method. Free brochure. Charlie Morgan, 118E, Bushnell, Florida.

FREE! Secrets—Dollar making mail plans. Unknown! Opportunities, Sumas, Washington.

CANDIED Popcorn and potato chip equipment. Eakins, Box 933-A8, Springfield, Ohio.

"EVERYBODY Likes candy"—Make professionally home. (Our 47th Year.) Ragsdale Candies, B107, East Orange, New Jersey.

THE Law says, "You must keep records." Use our "Simplified Mailorder Book-keeping System." Recommended for small businesses, agents, salesmen, self-employed persons, mailorder "beginners," etc. \$1.00. Tasker's, Box 3131, Alexandria, Virginia.

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YOUR Own high profit business. Sell name brands, full or part time. No inventory, no investment. More than 2,000 name brand items; lowest wholesale prices. Watches, jewelry, cameras, hi-fi radios, phonos, appliances, housewares, hardware, power tools, luggage, musical instruments, garden equipment, sporting goods, toys, many others. 8 floors of name brands. Million dollar inventory. Send for free, beautifully illustrated catalog now! Separate dealer price list. H. B. Davis Corp., Dept. 11, 145 W. 15 St., New York 11, N. Y.

RAISE Rabbits on \$500 month plan. Plenty markets. Free details. White's Rabbitry, Delaware, Ohio.

SALES-By-Mail could be your opportunity. Valuable food for thought free. Rawson Wood, 3974 Milwaukee, Chicago 41.

BIG Profits importing, free details! Mullins, 2929 Long Street, Kingsport, Tenn.

MONEY Plans! "Secret Journal." Grandpa, two daughters made \$2500 first month! Work home. Publicos, Oceanside, Calif.

REBUILD Batteries; repair dolls; make rubber stamps. "75 ideas" free. Universal, Box 1076-A, Peoria, Ill.

TO \$100.00 Weekly, Sparetime, home operated mailorder business. Successful beginner's plan. Everything supplied. Lynn, 10420-M National, Los Angeles 34.

LEARN Real estate by listening to records. Lee Institute, Brookline 46, Mass.

CAMERA Owners! Earn \$50.00 week-ends! Instructions \$1.00, information free! Kline, 935-PM North Austin, Chicago 51, Illinois.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

PIANO Tuning learned quickly at home. Tremendous field! Musical knowledge unnecessary. Information free. Empire School of Piano Tuning, Champaign, Ill. (Founded 1935).

WANT To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes, disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 5234 Broadway, Chicago 40, Illinois.

\$70 WEEKLY—Home, spare time. Simplified mail bookkeeping. Immediate income—easy! Auditax, 34757A, Los Angeles 34.

MINK Raising information free. Complete. Lake Superior Mink Farm. Superior, EE1, Wisconsin.

MAKE Flexible molds. Cast plaques, figurines. Free sample. Tooker, 1045-R Fairview, Hamilton, Ohio.

NATURAL Molding rubber, extra thick. Free sample. W. Woolley, 1016-A Donald, Peoria, Illinois.

TREMENDOUS Possibilities in mail order. I retired after five years. Write Norris Cole, 217 West 49th, Bradenton, Florida.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 26, 715 Ensor Street, Baltimore 2, Maryland.

I want to send you proof of the wonderful pulling power of Popular Mechanics classified pages. What's your proposition? Write me today. Include literature if possible. F. W. Johnson, Manager Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11, Ill.

BIG Money raising fishworms and crickets. Free literature. Carter Farms, Plains, Georgia.

11,000 NEW Prospects daily. Baby record books, shoes, albums. Sell mailorder. Use our literature. Write: No-Co-Ro, Capitola, California.

BAKE New greaseless doughnuts in kitchen. Sell stores. Free recipes. M. Ray, 3606 South 15th, Minneapolis 7, Minnesota.

FIX Typewriters. Inexpensive home course teaches factory secrets. Free booklet. Athey, Tarentum, Penna.

PLATE Baby shoes, jewelry, gifts, bronze and colored pearl. Free booklet. Platek, 11029 South Vermont, Los Angeles 44.

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FREE Catalog. Contains hundreds of businesses, farms and income properties throughout U.S., Canada. Specify type and location desired. Deal direct with owners. U. I. Buyers Digest, 1608 Hillhurst, Dept. PM-3, Los Angeles 27, Calif.

WE Pay \$3.50 lb. dried. Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We have 25,000 customers. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Wash.

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MARKETS Everywhere. Make artistic concrete birdbaths, pottery. Chemical coloring. Home workshop. Stucco-rock walls. Hundred varieties. Hollywood Cementcraft, 8527-K Wonderland, Hollywood 46, Calif.

FREE Folio "\$5,000-\$45,000. Unlimited Vacations." No merchandise. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

MAKE \$46 From square foot plywood; jig saw necessary. Free details. Woodart, Bridgewater, Mass.

"MAILORDER Laws and Regulations" and "Mailorder Rules for Beginners." Learn about necessary licenses, different taxes, legal requirements, etc. Both books, \$2.00. Tasker, Box 3131, Alexandria, Va.

GROW Orchids at home. Profitable, fascinating. Successful home grower explains special light, temperature and humidity conditions orchids need. Free! Full details. Orchids, 100 S. Vermont, Los Angeles 4.

\$34.70 TWO Hours. Manufacturing. No selling. Carlayne Castings, 1893 Fremont, Rapid City, South Dakota.

MAKE Money selling recipes and household hints by mail. Information free. Barrett, Dept. CA-27, 7464 No. Clark, Chicago 26.

MAKE \$50,000.00 Yearly from home. Informative plans free. Fortune Enterprises, Addison, Illinois.

LEARN Sewing machine repairing. To \$125 weekly. Sparetime. Supplies. Add to present business. Write today! Taylor Service, Box 2128, San Bernardino, Calif.

NO Door-to-door or store selling. Yet your sales pyramid. Nothing else like it. 70% profit. National, Box 291, Addison, Ill.

MOTEL Supplies business and mailorder to institutions. New! High income. Investigate. Hermes Advertising, 152-C West 42, New York City 36.

BRONZE Baby shoes: Instructions, equipment and mountings for genuine electroplating process. Largest supplier of all plating equipment, supplies. Free catalog. Hollywood Bronze Supply, Dept. B-3, 1624 East First, Los Angeles 33, Calif.

EXPORT-Import business made easy. Complete setup service, not just instructions. Hermes, 152 West 42, New York City 36.

EXCITING Mail order business. Something new. Guaranteed money makers. Campbell's Service, Millwood, Kentucky.

BUY Wholesale! 30-80% discounts! Nationally famous brands. Typewriters, housewares, appliances, watches, furniture, musical instruments, cameras, tools, etc. Consolidated Distributors, Clifton 1, New Jersey.

QUICK Profits, with no capital! Take orders for magazines your neighbors like, want. Make cash on the spot! We show how with free kit. Get yours now. Write McGregor Magazine Agency, Dept. 310, Mount Morris, Ill.

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BE A real estate broker. Study at home. Send for free catalogue. Midwest School of Real Estate, 68 North Chicago Street, Joliet, Illinois.

FREE Profit opportunity. New device lets any handyman do professional TV repair. \$200 monthly easily. Electronic Engineering, Dept. BC-179, 1038 So. LaBrea, Los Angeles 19.

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I Got rich in the dry cleaning business with no investment, so can you. Free details. Write: Imperial School of Dry Cleaning, Dept. PMC, 1700 Touhy Avenue, Chicago 26, Illinois.

SHINE Shoes without polish. New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 101, Akron, Ohio.

GUARANTEED Market! Earn ready cash raising fishworms for us! Backyard, garage, basement! We buy your crop! Exciting details free! Oakhaven-38, Cedar Hill, Texas.

FUNMAKERS, Gadgets. Wholesale catalog free. Exciting samples 25¢. Dohn-GB-Marks, Broadview, Ill.

1200 ITEMS Drop shipped. Wholesale circulars. Catalogs supplied. Davenport Distributors, G.P.O. Box 1354-L, New York 1, N. Y.

INVISIBLE Reweaving: \$5 in one hour possible reweaving burns, tears, moth-holes. Spare-full time. Free details. Skill-weave, Dept. C-169, 335 W. Madison, Chicago 6.

START Your own business on credit (U.S. and Canada). Be your own boss. 1425 dealers sold \$5,000 to \$32,000 in 1957. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant profitable business backed by world-wide industry. Write Rawleigh's, Dept. I-U-PPM, Freeport, Ill.

"50 NEW Home-Business Ideas" booklet. Sample free. Spray exotic Velvet-Suede on anything. Plockcraft-SR. Los Angeles 61.

GROW Expensive herbs for us! Big profits home-business of your own. Year around profitability! We supply everything necessary! Send for free rare seeds and revealing plan. (State your age.) National Herb Exchange, Dept. SR, Gardena, Calif.

\$250.00 WEEK Profit possible. Earn at home spare time with fascinating printing method. \$5 starts you. Send no money now. Free confidential facts and valuable samples. Screen-Print SR, Los Angeles 61.

MAKE Extra money. Cash commissions. Everybody buys easy-to-sell advertising book matches. Union label. All sizes. Cuts for all businesses. Powerhouse selling kit free. Steady repeat business. No experience necessary. Superior Match Co., Dept. MX-958, 7528 S. Greenwood, Chicago 19.

ESCAPE Wage slavery! Start profitable mailorder business. Exciting details! National, 2696 So. 10th, Fresno 25, Calif.

BUY Direct from factories—Appliances, cameras, watches! Free details! Cam Company, 6810PM—20th Ave., Brooklyn 4, N. Y.

HOUSEWIVES. Others. \$30-\$100 weekly sparetime assembling and distributing rockhound jewelry. Vikingcraft E. Inglewood 4, California.

OWN A collection agency. Pays big. Franklin Credit, Roanoke, Virginia.

BEFORE You start your small business. Read Conrad's Scrap Book! Avoid costly mistakes caused by misleading advertising. \$1.00 prepaid. If not satisfied money cheerfully refunded. Conrad Stadick, Searles 2, Minnesota.

BOOKS. Plans, formulas, money making opportunities, correspondence courses. Descriptive literature 10¢. Frost, Box 852, Passaic, N. J.

MEN—Opportunities. Formulas making shampoos, saving coal. Hundreds more. Name yours. Send \$1.00. Monestere, 40 Rhode Island Ave., Somerville 45, Mass.

WANTED: Home producers, to be subcontractors. Cast plastic products for manufacturers in our clearing house service. Thousands of easily made items required. Cash in at home, without previous experience. Plastic Service Associates, Dept. 9-PM, East Boston 28, Massachusetts.

PROFESSIONAL Card reading taught reasonable. Results guaranteed. Winzinger, 7205 33rd St. No., St. Petersburg 14, Fla.

MAILORDER Booklet free. Covers advertising, products, procedures. Smelser, Troy, Missouri.

BIGGEST Money-makers in the field. Acme saw and lawn mower sharpeners. Write for free literature and terms. Max Mfg. Co., 138 Stockton Ave., San Jose 26, California.

36 MINIATURE Autos \$1.98. Play traffic safety. Square, Excelsior, Minn.

DOLLS! Dolls! Dolls! We teach you to repair, make, sell all kinds of dolls and accessories including clothing. Study at home. Earn while you learn. Diploma. Free catalog. Doll Hospital School, Studio M-98, 11826 San Vicente Blvd., Los Angeles 49, Calif.

START Your own nursery. Root cuttings in your home, yard, garden. Amazing Nu-Root material, guaranteed. Root over 400 cuttings at one time. Fill your yard with plants, bushes, trees. Good all year \$2.98. Nu-Root, Box 1525, Biloxi 1, Miss.

AMAZING Profits importing. Act now. Gilcoe, 20 Magnolia, Norwalk, Conn.

SELL By mail profitably. Beginner's manual gives tested methods. 25¢. Alfano, 19 Pine Closter, New Jersey.

SELL Electric garage door operators. T & M Supply, Box 231A, Egg Harbor, New Jersey.

\$125.00 WEEKLY Spare time repairing appliances! Start first day! Details free! Scott, Box 388, Great Neck, New York.

PLASTERCRAFT Molds, liquid rubber, plasters, flocks, candle supplies. Catalog and manual free. Blue Rapids Supply. Blue Rapids, Kansas.

GETTING Nowhere selling? Free information. Nebrick, 30891 Ridgeway Drive, Farmington, Mich.

YOU May be missing the opportunity of your lifetime without knowing it! Alert yourself to profits in the booming franchise field. Distributorships, dealerships, agencies, retail operations available nationwide. Stop looking, start earning! Request interesting details today. National Franchise Reports, W-528, 333 North Michigan, Chicago 1.

BOOKKEEPERS. Accountants. Operate a bookkeeping service. Part or full time. Amazing simplified system. Wonderful money-making opportunities. Complete information free. National Bookkeeping Publishing Co., Suite 307, 3435 Broadway, Kansas City 11, Mo.

LEARN Fascinating hobby-business, engraving plastics! New engraving-carving pantograph attachment. "DupliScaler." Uncovers exciting profit opportunities! Details, sample 10¢. Desco Distrib., 5262-P Van Nuys, Van Nuys, Calif.

MAKE Fortune being wholesale distributor of appliances, jewelry, housewares. We drop ship catalogs, merchandise. Rush postcard for free details. Rickey's, Box 12X, Scottsburg, Indiana.

LIQUID Marble—Colorful, glossy! Molded, brushed, sprayed! Particulars free. Marbleizing Service, Edwardsville, Ill.

OPERATE Mailorder folk business. Free details. Ballard's, 425 East Catherine, Louisville 3, Ky.

FREE: "Profits" — "Flashnet." Men, women. Capt. Wm. Lewis, Tampa 9, Fla.

MANUFACTURE Toys! Instructions, directory, independence. Benko, 400 E. 66th Street, New York City 21.

INTERNATIONAL Home import mail-order business! Experience unnecessary. Earnings unlimited. Foreign Traders, Meramec Building, St. Louis 5-PD, Mo.

GET Rich scientifically. Choose your job. Amazing proven technique. Guaranteed. Free vocational test. Frederick Lane Associates, 7912 Curragh, Burnaby 1, British Columbia, Canada.

\$5,000 YEARLY. Spare time at home. Nothing to buy. No local selling. Dignified. Guaranteed. Home Harvest, Rt. 3, Box 3491-A, Albuquerque, New Mexico.

LIQUID Molding rubber, free sample. Shellcraft supplies. Chaney's, 1907-A East Road, Jacksonville 11, Fla.

WIN Cadillac bonus, up to \$20,000 year. Amazing new wholesale deal! Strateway, 2114-A, Charlotte 1, North Carolina.

MAIL Order laws and regulations. Anyone operating a mail order business should know the different laws and regulations. Otherwise there is the possibility of fine or prison sentence. Book \$1.00. Central Trading Co., Box 254, Sudbury, Ontario, Canada.

EXTRAORDINARY Opportunity! Retire now! Lead leisurely life. Remarkable book shows how. Free details. Belmont, Wyckoff 16, New Jersey.

MAIL Order advertising agency executive reveals sensational no-risk advertising and merchandise methods. Start in office or home; minimum capital; positive profits. Free details: Impact! 3402 Prospect Avenue, Dept. 11-9, Cleveland 13, Ohio.

INVENTIONS Wanted to fill existing needs. Creative? Free particulars. Woodward, 1221 Edgewood, Havertown, 3-R, Pennsylvania.

CASH From sawdust, tin-cans, newspapers. Over 200 methods. Instructions \$1.00. Charles Company, 12-XAM, Norwood, Ohio.

SHARPEN Scissors, pinkers. Inexpensive machine. Sharpening supplies. Blackhaws, Sheldahl, Iowa.

HOME Mail order business opportunity! We supply everything. Fill your orders. Guide you. Eastern, Box 142, Boston, 24-C, Massachusetts.

BOSS Your own home business. Profits 1,200%—3,000%! Make, distribute, popular shellcraft jewelry. Sells itself wherever displayed! No machinery, equipment. Associate dealers wanted. Details free! Smith, Dept. A, Box 804, Panama City, Florida.

MONEYMAKING OPPORTUNITIES

WIN Contest prizes. Contests — Helps. Contests. 25 Earl, Red Bank, N. J.

DOLLARS From dolls! Doll Hospital School, Studio M 98-C, Los Angeles 49, Calif.

WANT To make big money at home? \$10.00 profit in an hour possible with invisible mending. Make tears, holes, disappear from clothing, fabrics. Steady year-round demand from cleaners, laundries, homes. Details free. Fabricon, 6260 Broadway, Chicago 40, Illinois.

MAKE Big easy profits making costume jewelry at home in spare time! Quick, easy to make; easier to sell! Details free! Don-Bar, 3511 W. Armitage, Dept. J-192, Chicago 47, Ill.

MAKE Money gathering roots, herbs, weeds, leaves, tree seeds, flowers, plants! Over 200 varieties! Listed buyers for all you can ship! Easy! Pleasant! Get free book! Revealing beginners packet. 25¢. Fortune Mart, 221-A Lincoln, Worcester 5, Mass.

SELL To Uncle Sam. He'll pay you \$35 an ounce for the fine gold in all the junk jewelry you send in (less a small handling and refining charge). Send me your name on a postcard now for full particulars free. Leslie Patton, 335 W. Madison St., Dept. C9-M, Chicago 6.

BIG Paying, mail operated, home collection agency. Start privately, sparetime, earn while you learn. Complete 12-weeks course with confidential details postpaid \$1.00. Interstate, 37 Besch, Albany 9, New York.

\$36-\$200 WEEKLY Plating baby shoes, making jewelry, novelties, etc., at home. Details free. Jo-Ca Electroplater, 7840-D Northwest Sixth Court, Miami 50, Florida.

\$5,000.00 ANNUALLY Possible for you in mailorder. Free information. Ransie, Box 1719-A, Richmond 14, Virginia.

EARN Money at home. Thousands do. "Home Business Digest" tells how. Sample dime. Roycraft, 2763 Sibley Road, Augusta, Georgia.

AMAZING Successes through franchises! Become exclusive franchise holder your territory. Information rushed. National Franchise Reports, 333 North Michigan, Chicago 1.

"MAKE Money with Local Merchants." New manual, \$1.00. Winters, 221 Edson, Lombard, Illinois.

ATTENTION Typewriter owners. Make handsome profits. Write today. Groves Company, 682, Hastings 7, Nebraska.

WHOLESALE Bronzed baby shoe mountings. Equipment. Poster, 1520 Ardmore, Chicago 46.

COINS. New folio. Details 10¢. Patterson, 1916 Elm, New Albany, Indiana.

OPERATE Profitable mailorder business. Write Rocky Service, 6740 Waterworks Rd., Norfolk 2, Virginia.

FREE! Unusual new plan. Shows "How to Retire Without Money." Retire now! Lead leisurely life. Belmont, Wyckoff 17, New Jersey.

MAIL Order plan—Spare time or full time earnings. Details 10¢. Heritage Thrift Foundation, 1400 Davis Building, Dallas, Texas.

LEARN Pest control! \$1000.00 monthly proved. Rid homes, farms, businesses of termites, rodents, pests. New short-cut methods! It's easy, fascinating. Huge demand. Free details. APOCA, Dept. 1L, 15015 Ventura Blvd., Sherman Oaks, Calif.

SELL Information! Sample moneymaking publications. 25¢. Rainone Publications, Middle Village 79, New York.

FREE Particulars and proofs from our many customers who are making money with our brush plating outfit that requires no tanks and formulas for silvering mirrors of all kinds, metal and wood finishes, silver plate and polish and 50 other money making formulas. Write today. Gun Metal Co., Ave. H, Decatur, Illinois.

HUNDREDS Home business opportunities 25¢. Grayhouse, 7000 Monmouth, Ventnor, N. J.

HOTTEST Mail order plan ever! Sell photos, films, art novelties. Huge proven profits! Free details! Profits Unlimited, Dept. 1L, 15015 Ventura Blvd., Sherman Oaks, California.

INCOME Year around in your spare time. Your telephone can earn you a comfortable living with this profit proven plan. Your total investment: Send only \$1.00 with this ad for \$2.00 copyrighted publication. Rush! Limited offer! To Jerry Brennan Associates, Inc., Apt. 101, 1320 Keiton Avenue, Pittsburgh 16, Penna.

\$25.00 WEEKLY. Making orchids at home. Easy. Boycan, Sharon 71, Penna.

FIFTY Proven plans for complete independence at home or travel. Even for large families. Satisfaction guaranteed. Plans \$1.00. Pony Express, 146 So. MacDonald, Mesa, Arizona.

LIKE Adventure, travel? I make over \$750.00 a month plus meals, lodging, and travel expenses, no selling. \$2.00 for complete information how you may do the same. John Lindsey, 2422 So. 162 St., Seattle 88, Wash.

MAKE Money writing short paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C-27-V, 7464 Clark, Chicago 28.

BIG Profits quick! Make and sell costume jewelry. Details free! Modern Craft, Box 11088-M, St. Petersburg 33, Florida.

\$15,000 PROFIT in one year possible, on \$5.00 weekly. Fabulous but true. Minimum of attention, respectable field. 15% profit can be guaranteed. Experience unnecessary. Proof, complete detailed plan, only \$1.00. Satisfaction or refund. Columbia Enterprises, 8203-P, Grubb Road, Silver Spring, Maryland.

BUY Wholesale! 30-80% discounts! Nationally famous brands. Typewriters, housewares, appliances, watches, furniture, musical instruments, cameras, tools, etc. Consolidated Distributors, Clifton 2, New Jersey.

BOOKS; Hundreds of subjects. Big 1958 book catalog—10¢. Popular Mechanics Press, 200-BC East Ontario St., Chicago 11.

OPPORTUNITY Earnings to \$20.00 per hour part, full time proven business, tobacco line. Franchise details. Henford, Dept. PM, P.O. Box 59, Paramus, N. J.

\$100.00 WEEKLY. Raise redworms soil-less way. Charlie Morgan, Bushnell, Fla.

MEN—Women! Start money-making plastic laminating business at home in spare time. Material that costs 11¢ brings back \$2.50. No canvassing or selling but mail orders bring in \$20 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-3-H, 1512 Jarvis, Chicago 26, Ill.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests, rules. Sample magazine 25¢. General Contests, 1609½ East 5th, Duluth 12, Minnesota.

MAKE \$200.00 Monthly spare time with jigsaw. Free details. Elkman, 346F North Summit, Sioux Falls, South Dakota.

MAKE Money, operating mail order business, selling business cards. Vosacek Printing, 4444A Ute, San Diego 17, Calif.

START Big-pay business at home in spare time. No experience needed to operate little table-top machine for bronzing baby shoes. Make \$5.46 profit on every pair. Full particulars free. Send postcard to Mason, 1512 Jarvis, Room CM-3-H, Chicago 26, Ill.

CIGARETTES—Improved roller makes 20 for 9¢. Facts free. Moberly, Box 321, Owensboro, Kentucky.

FREE Polio "\$5,000-\$45,000. Unlimited Vacations." No merchandise. Unknown! Work home, sparetime! Haylings, Carlsbad, Calif.

READ Progressive Mailtrade. the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

BIG Money raising. fishworms and crickets. Free literature. Carter Hatchery, Plains, Georgia.

SELL Titania gems. Far more brilliant than diamonds. Catalog 10¢. Diamonite, 2420-M 17th, Oakland 5, California.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 27, 715 Ensor Street, Baltimore 2, Maryland.

JOIN The prosperity parade with a mail order bookshop in your own home. Valuable information free. Practical Publications, 3974-P Milwaukee, Chicago 41, Ill.

WE Pay \$3.50 lb. dried. Grow mushrooms. Cellar, shed and outdoors. Spare, full time, year round. We have 25,000 customers. Free book. Washington Mushroom Ind., Dept. 173, 2954 Admiral Way, Seattle, Wash.

FREE "4000 Word Report" on new depression-proof business opportunities. Fortune Enterprises, Addison, Illinois.

EASY To start rubber stamp business at home in spare time. Make up to \$9.80 an hour without experience. Facts free. Write to Roberts, 1512 Jarvis, Room CR-2-H, Chicago 26.

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BOXES, Plastic. Free list. Althor, 170 Bay 23 Street, Brooklyn, N.Y.

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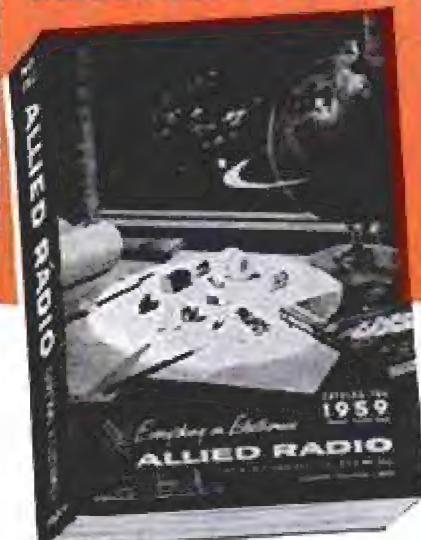
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WHERE-TO-BUY-IT INDEX

AUTOMOTIVE

- Big car? Small car? You may get both..... 81
Car-door brackets hold long lumber (Kip Co., P.O. Box 235, Livingston, N. J.).....117
Extension cables replace tow rope for emergency starting (George S. Iredell, Iredell Farm, R.F.D., Zionsville, Pa.)...128
Mystery: Six passengers but where's the engine?.....140

AVIATION

- Here's a jet that takes off vertically in horizontal position... 79
Helicopter flies automatically..... 80
Loaded supersonic jet propelled into air without touching runway 80
Sub missile passes test..... 81
Sikorsky helicopter lands on water—or anywhere (Sikorsky Aircraft, Div. of United Aircraft Corp., Stratford, Conn.)... 96
British twin-jet plane can deliver nuclear weapons.....104
Jet helicopter powered by gas turbine (Karman Aircraft Corp., Bloomfield, Conn.)112
East Germans build first medium-range passenger jet.....112
Hydro-ski enables rubber plane to land and take off on water...117
Water-fog curtain prevents spread of fire during plane fueling...127
Monitor listens in on 28 frequencies.....134
Plane-reservations system gives "electronic" answers.....135
Electromagnetic detector can locate underwater subs.....136
Navy and Air Force weapons look alike but they don't act alike144
Build-it-yourself plane available in kit form for just \$1000...150

CONSTRUCTION

- Nitrogen gas preserves Kansas water pipeline for future drought..... 87
Powered wheelbarrow climbs mountain..... 96
British architect works under hemisphere of glass.....140
Sidewalk superintendents have ringside seats.....141
Giant jigsaw radome for Dew Line can be put up in 1½ days...150

LAWN AND GARDEN

- Switch stops mower (Dunn's Motor Sales, 2410 Bladensburg Rd. N.E., Washington 18, D. C.)..... 79
Walk-along spray unit covers two-foot swath (O. E. Linck Co. Inc., Clifton, N. J.).....104
Mower becomes hedge trimmer.....111
Three-wheeled power mower can cut close to trees (Seminole Mower Co., P.O. Box 1311, Decatur, Ill.).....116
Fiber mat gives grass seed a good start and retards weed growth (Minnesota Mining and Mfg. Co., 900 Bush Ave., St. Paul 6, Minn.).....116

MISCELLANEOUS

- Push-button camp wagon..... 93
A dentist turns sculptor..... 98
Miniature battery pack has enough power to fire 35 flashbulbs (Anchor Photo Supply Co., 6322 S. Western Ave., Chicago 36)101
Trailers for work and play.....114
Mighty totem pole begins voyage to London.....127
Big Italian tanker run by 14,400-hp. motor.....129
German police call box.....134
Trailer truck carries tank cars from siding to industrial plant...135
Newborn babies are television stars on hospital's closed circuit136
Interlocking plastic mat forms into many shapes.....151
Plastic holder guards Thermos (The American Thermos Prod. Co., Norwich, Conn.).....151

OUTDOOR SPORTS

- They walk on water! (Charles J. Belden, 16740 Gulf Bend, St. Petersburg 6, Fla.)..... 78
Fish triggers own fate (Lucky Strike Bait and Lure Co., 4111 Grant St., Gary, Ind.)..... 79
Kit converts tube into boat (L. Lek, 1600 Mecca Dr., La Jolla, Calif.)101
Portable range gives golfer practice at home (Jack Oliver, Engineers Country Club, Roslyn, L. I., N. Y.).....129
Improve your wing shooting.....146
Transparent bait container lures insects into tweezers (C. S. Williamson and Co., Orangeburg, S. C.).....151

(Continued to page 68)

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(Continued from page 66)

SCIENCE

Chemicals in the air detected by infrared.....	87
Contact lenses made with bifocal prescriptions.....	88
Electronic draftsman makes graphs and drawings (Electronics Assoc. Inc., Long Branch, N. Y.).....	88
Rockets drop aluminum chaff to measure wind behavior.....	88
Solar cells power hearing aid (Zenith Radio Corp., 6001 W. Dickens, Chicago 39).....	96
"Bicycle" chemical sprayer speeds weed killer tests.....	104
Six-ounce voice box aids human speech (Rand Development Corp., Cleveland, Ohio).....	116
Radar system checks buses on routes in London.....	123
Scientists discover heaviest element has half life of three seconds.....	123
Engine changes atom heat into electricity.....	128
Portable gas detector (Union Industrial Equip. Corp., 20 Davis Ave., White Plains, N. Y.).....	134
Vest keeps dry cells warm with heat from body (Burgess Battery Co., Freeport, L. I., N. Y.).....	135
Armor of plastic and glass fiber protects man from bullets.....	136
Diary of a manmade "moon".....	141
Complex electron microscope built by teen-ager.....	144
Liquid cargoes travel in big plastic tubes (E. I. du Pont de Nemours and Co., Wilmington, Del.).....	145
Rust-resistant wheat of future developed by atomic scientists.....	222
Infrared defense weapon "too good" to be used.....	224
Ultrasonic waves show inside of eye.....	238
Are there millions of inhabited planets?.....	244

WHAT'S NEW FOR YOUR HOME

Radiant heat screen.....	142
Electric barbecue.....	142
Louvered door.....	142
Socks dispenser.....	142
Log tongs.....	143
Portable wringer.....	143
Shoe scraper.....	143
Double-mirror cabinet.....	143

Radio-Television, Electronics

The big switch to stereo.....	152
-------------------------------	-----

Craftsman and Shop Notes Index

AUTOMOTIVE

Car-door light-switch control.....	158
Correct warming of engine protects valve lifters.....	164
Sources other than ignition cause noises in car radio.....	168
Rust on stainless steel caused by improper cleaning.....	188
Antifreeze is not reusable.....	192

FARMING

Adjustable-height sack holder speeds filling with shovel.....	164
Bulldozer blade.....	195
Chute above rack simplifies feeding baled hay.....	195
Attaching rural mailbox.....	195
Light denies corn to raccoons.....	195
Work-saving livestock feeders.....	197
Milk room warmed by heater taken from automobile.....	205
Sliding latch on farm gate is "livestock resistant".....	205

HOUSE AND HOME

Keep pictures straight.....	159
Ice shell on frozen meats seals in original flavor.....	159
Lamp chimney and pie plate makes hopper bird feeder.....	159
Plywood "plastered" with paint.....	164
Dustproof wall cabinet.....	165
Warped plank door straightened by installing X-member.....	168
Garage-door weather stripping replaced with heater hose.....	168
Wire hook for paint pail has "built in" handhold.....	172
Sagging garage doors repaired after wedges realign them.....	172
Consistency check for pouring concrete sidewalk.....	172
Wetting agent added to water aids removal of wallpaper.....	182
Backflushing with solution stops leak in heating system.....	182
Tighten water-tap handle.....	182
Remove cork with nail.....	182
Method of removing wallpaper utilizes paint roller.....	186
Pencil erasers in stop strip silence rattling door.....	188
Cork inside bottle removed with strip of tape.....	188
Labor-saving leaf carrier.....	192
Amplify door-chime sound.....	192
Low-cost "storm shutter" awning.....	193
Simulated wrought-iron items cut from tempered hardboard.....	194
Initials identify overshoes.....	194
Magnet holds baby pins.....	194

(Continued to page 70)

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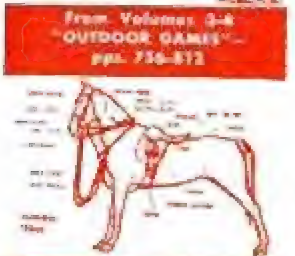
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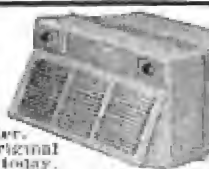
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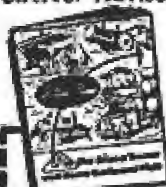


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(Continued from page 68)

Cleaning solution fed to brush from attached plastic bottle.....	198
Magnet holds shopping list.....	200
Radio heat softens polish.....	200

MISCELLANEOUS

Coal for scale-model trains.....	168
Modified corner framing saves time and lumber.....	168
Prairie schooner.....	169
Shooting tips.....	178
Scale easier to read when coated with black crayon.....	179
Yarn used to make pictures on sandpaper drawing board.....	194

OFFICE, SHOP AND STORE

Trammel made from paper clamps and rules.....	159
Jig made of bricks simplifies "baling" newspapers.....	188
Dulled razor-blade corners "sharpened" with pliers.....	194
Rubber tiles are "place mats" on barber-shop work counter.....	194
Rubber band on gummed labels eliminates curling problem.....	194
Eraser shield for typewriter protects key mechanisms.....	200

ON THE MARKET

Special cleaner for aluminum.....	199
Plastic ceiling tiles.....	199
Nonflammable paint remover.....	199
Ceramic cabinet hardware.....	199
Window-wall unit aids in construction.....	199

PHOTOGRAPHY

Photolight standards.....	173
Tape ends of exposed roll film to prevent light streaks.....	179
Bulk developer sealed in convenient packs.....	179
Additional lens taped on camera permits taking closeup shots.....	179

SHOPPING FOR TOOLS

Roll-up ladder.....	209
Direct-drive chain saw.....	209
Pad sander and jigsaw attachment.....	209
Aluminum pipe wrench.....	210
Power bits for boring holes.....	210
Positioner adapts to manual or automatic welding.....	210
Torque washer.....	210
Measuring machine.....	210
Cross-slide milling table.....	211
Grinding and deburring machine.....	211
Aluminum snips.....	211
Light-staple gun.....	211
Liquid "lockwasher".....	211

SOLVING HOME PROBLEMS

Easy way to hang pictures.....	170
Doorknob turns easily when hands are wet.....	170
Tubular kitchen chairs kept from scratching walls.....	170
Photo tabs useful for record titles.....	170
Doorstops used as leg extenders for modern sofa.....	171
Dress pattern easy to fold.....	171
Sort hardware in muffin tin.....	171
Tamperproofing plug on electrical appliance.....	171
Frozen-food containers useful to do-it-yourself.....	171

WORKSHOP HINTS

Pick-up pad for small brads.....	158
Paintbrush bristles reshaped by storing in cardboard holder.....	159
Cost of drill set reduced by buying alternate sizes.....	172
Tape reinforcement on sandpaper prevents edges from tearing.....	172
Notch in adhesive applicator permits accurate spreading.....	172
Scratchproof work surface for cutting aluminum sheet metal.....	182
Tire sections on sawhorses protect work from damage.....	198
Magnet "spots" brass plate.....	198
Wood screw securely anchored with small finishing nail.....	198
Crosswise dowel in plywood holds screw securely.....	198
One-man handling of joist aided by bent nail.....	198
How to test a paintbrush.....	204
Concrete base for shop anvil serves as pipe bender.....	205
Hinges lubricated with soap.....	205
Plug of power tool is locked in workbench drawer.....	208
Washer storage.....	208
Chuck jaw drives lathe dog in emergency setup.....	208
Auxiliary table on bandsaw accommodates miter gauge.....	208
Modified measuring tape has "self marking" feature.....	212
Trouser-cuff nail "pockets".....	212
Adjustable stop on drill press modified for easier action.....	212
V-block on magnetic chuck adds extra holding power.....	212

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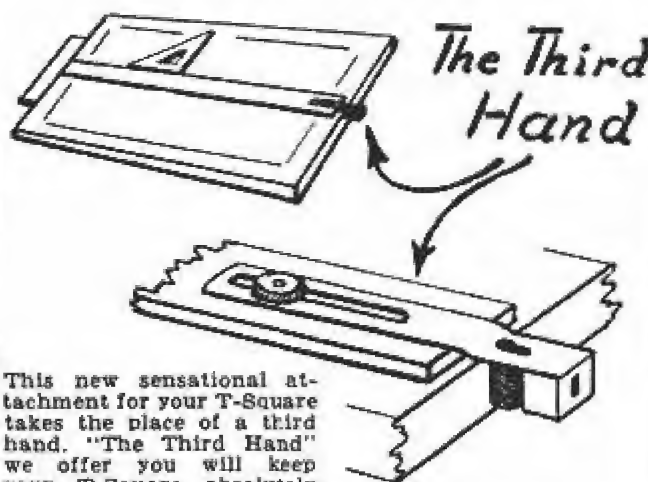
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CHAMPION

POPULAR MECHANICS

SEPTEMBER
1958

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 110 NO. 3

THESE ROCKETEERS PLAY SAFE

By Joseph E. Brown

1408 EDISON BLVD., DORRANK, CALIF.

WHEN SATELLITES started beeping overhead, thousands of youngsters all over the country launched themselves into a new hobby—rocketry—with or without parental permission.

No doubt about it, amateur rocketry can be extremely dangerous. But rocket clubs which have been in existence for years prove that it also can be reasonably safe—if rigid rules are enforced. Safety precautions, teen-agers have found, don't cut down on the fun; they just cut down on the accidents.

Take a look at a supervised firing of an amateur rocket:

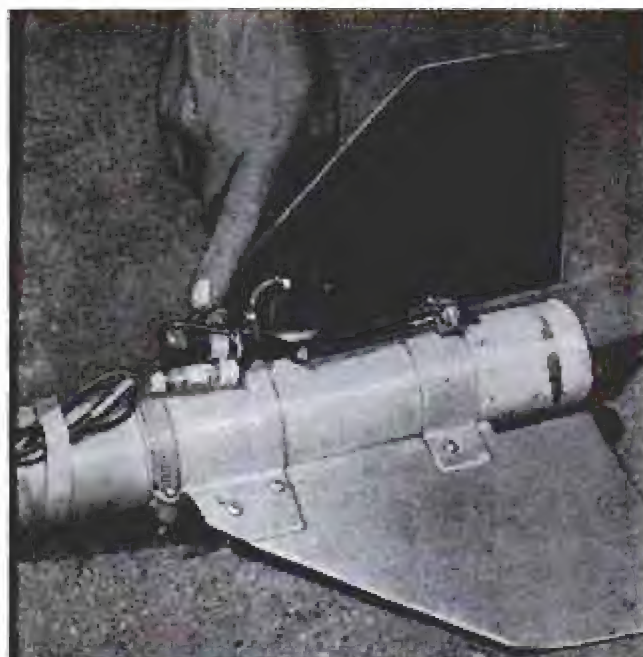
From a steel launching tower anchored

Teen-age rocketeer loads his four-foot rocket on the 10-foot launching stand in the Mojave Desert

See Nov-58, p. 6



Young member proudly shows rockets he designed. After fueling, the rockets are stored in shed, below



Ingenious mechanism arms the second and third stages of a three-stage rocket as the first stage falls away

to the floor of California's sprawling Mojave Desert, a silvery rocket vaults into the sky, its yellowish smoke trailing behind to mingle with the sagebrush.

Inside a concrete-block building, a tape recorder feels the rocket's heartbeat. Two men, wearing short-wave-radio headsets, wait for reports from tracking teams scattered in the brush. The rocket reaches its summit, hesitates, plunges earthward at 500 miles per hour.

A thousand feet from the launching pad, a crowd huddles in slit trenches behind thick earthen barricades. Earlier, before the missile was triggered by remote control from the safety of the blockhouse, a siren had wailed, a red flag fluttered, a light flashed and a loudspeaker blared intermittent warnings.

The occasion was the annual public firing of the Reaction Research Society of Glendale, Calif., one of the United States' two major nonprofessional rocket groups and an organization which is gaining new members every week.

Societies Promote Safety

The elaborate launching precautions—the siren, red light, flag, trenches and loud-speaker—are examples of how far the RRS and its sister societies have gone to promote safety in the field of amateur rocketry.

Since the RRS was organized 15 years ago in southern California, more than 300 rockets have been static tested and fired into flight. Yet the society's accident record in that period is without a blemish.

Unfortunately, all amateurs cannot boast such a record. Back-yard rocketry has bloomed everywhere in the United States.

Garages have become rocket-building



Pay-off question after months of labor: Will it work? Here a homemade rocket blasts off in successful test



Full safety precautions are observed during the critical period when the solid fuel is tamped into place

shops; science classrooms have taken on a space-laboratory air, and homemade missiles are shooting skyward from vacant lots.

And So, the Inevitable

With this burst of amateur interest in space, the inevitable has happened. In Texas, a homemade rocket fashioned from water pipe and stuffed with match heads blew up, permanently disfiguring its 14-year-old builder. Two youngsters in New England suffered near-fatal burns when a "dead" rocket reignited. Across the country, safety organizations began demanding action.

Connecticut banned amateur rocketry altogether. Other groups, such as the National Fire Protective Association of Boston, urged laws on a nationwide scale to curb such tragedies.

Firings Without Mishaps

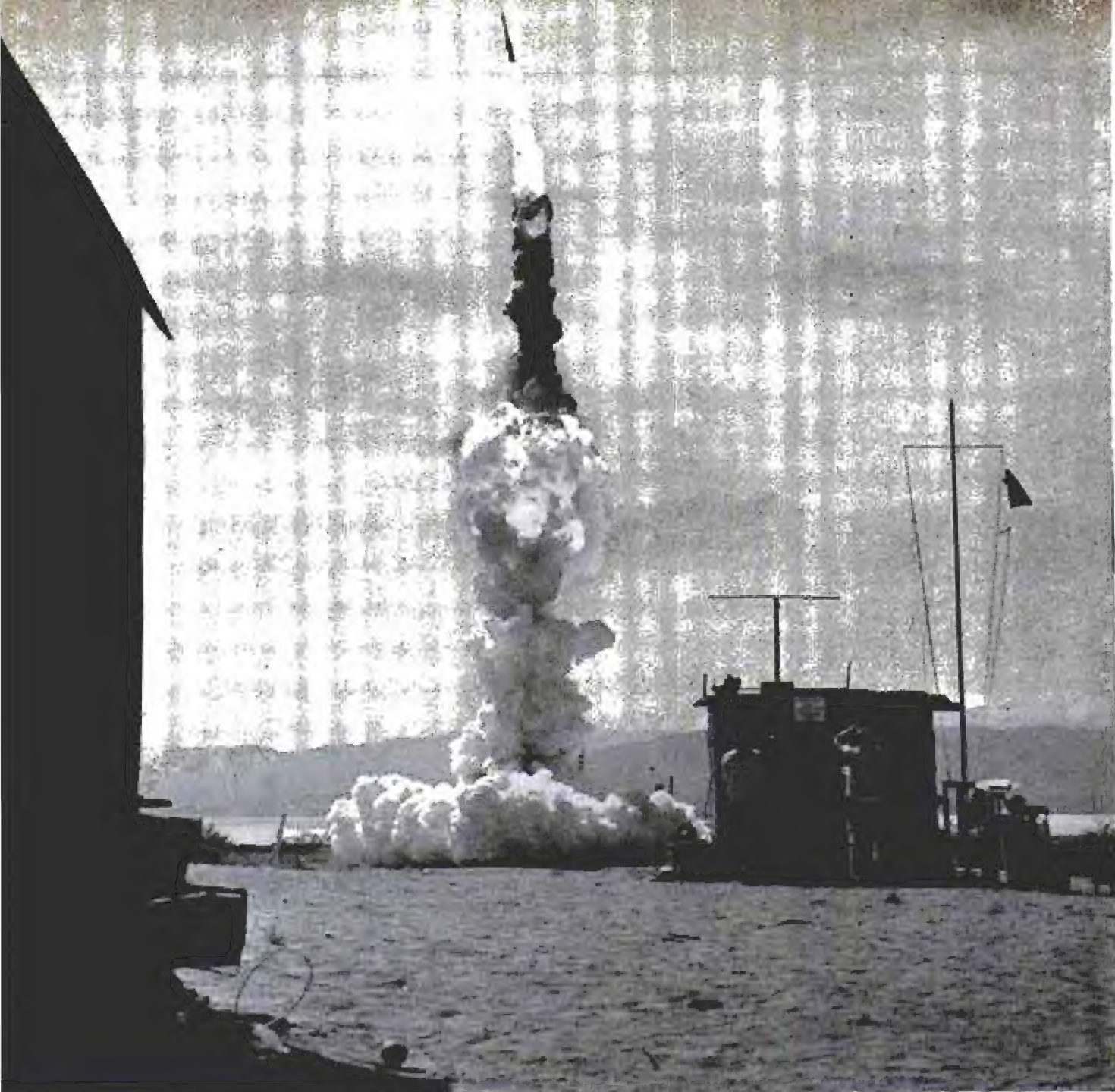
Yet today, in the vast open spaces of the West, future scientists banded in groups such as the RRS are firing dozens of rockets every year—within the law—without serious mishap.

The secret?

Supervision, a strict set of rules, and constant enforcement of these rules.

Spectators and cameramen observe launchings behind earthen barricades. The society reserves the right to remove any individual from the test area





Rocket takes off in perfect test as RRS officials watch from safety of blockhouse 40 feet from launching stand

POLICY TO BE FOLLOWED AT PUBLIC LAUNCHINGS **REACTION RESEARCH SOCIETY REGULATIONS**

The Executive Council of the Reaction Research Society has adopted the following policy to be followed at public launchings.

1. No rocket will be fired unless everyone is behind shelter.
2. Only the recovery crew will be allowed in the impact area between firings to find and flag the rocket.
3. The public will be allowed to go into the impact area to observe and photograph the downed rockets only at specified times.
4. The public will not be allowed in the fenced area except at the discretion of those responsible for the firing.
5. No alcoholic beverages will be allowed inside the test area.
6. No firearms will be allowed inside the test area.
2. **COMMENCE LOADING:** Signals, yellow flag, one blast of siren. All persons not engaged in the test must return to the sheltered area.
3. **ARMING:** Signals, red flag, two blasts of siren. All personnel must be in protected area. The rocket is ready to be fired.
4. **X MINUS ONE MINUTE:** Start of countdown.
5. **15-SECOND WARNING:** Siren and flashing red light. All persons must be behind protective cover during flight.
6. **FIRE:** All persons must remain behind protective cover during firing and be prepared to move to better cover in case of erratic flight.
7. In case of misfire or delay there will be an intermittent blast of the siren. All persons are to remain where they are and instructions will be given over the public address system.

FIRING PROCEDURE

1. **PREPARATIONS:** Signal, green flag. Spectators may witness and take pictures of activities but must stay clear of fenced areas.

We demand the cooperation of all visitors in observing these regulations and reserve the right to remove any individual from the area.

RRS President Calvin VanWagner, a semiprofessional rocketeer at 18, puts it this way:

"We live safety. There's always an element of danger in rocketry—amateur or professional—but we can at least minimize that danger. We hope to keep groups like the RRS going for a long time.

"At the same time," he adds, "we're trying to discourage the type of amateur rocketry that's given us a bad name."

Safety is written into the bylaws of the California society and carried out to the letter during the periodic private launchings and once-a-year public firings on a 40-acre site leased from the federal government.

RRS rockets range from two and three-inch bulletlike affairs to elaborate two and three-stage missiles equipped with parachutes, cameras and radio transmitters. None has yet gone aloft with a dog aboard; but the next best thing—insects—will take a ride soon on the Mojave.

Rocketeers Are Teen-Agers

The designer-builders are, for the most part, teen-agers of colleges and high schools in the Los Angeles area. Most of them will admit what they learn about their hobby—rocket construction, fuses, fuel and firing techniques—isn't new, and that most of their findings are old hat at Cape Canaveral or White Sands.

But the fail-and-try-again persistence reaps big dividends when carried back to school classrooms and laboratories.

VanWagner says, "We could find out from books in a minute what may take us days to learn in the desert. But that's no real achievement. Besides, we may come up with something accidentally that can benefit rocketry in general."

The RRS has been experimenting, for example, with rocket mail: a field which, if properly exploited, could someday become as common as airmail.

The RRS site, about 22 miles northeast of the steaming desert town of Mojave and about 120 miles from Los Angeles, sprawls, along sagebrush-covered terrain from a range of hills on one side

(Continued to page 240)

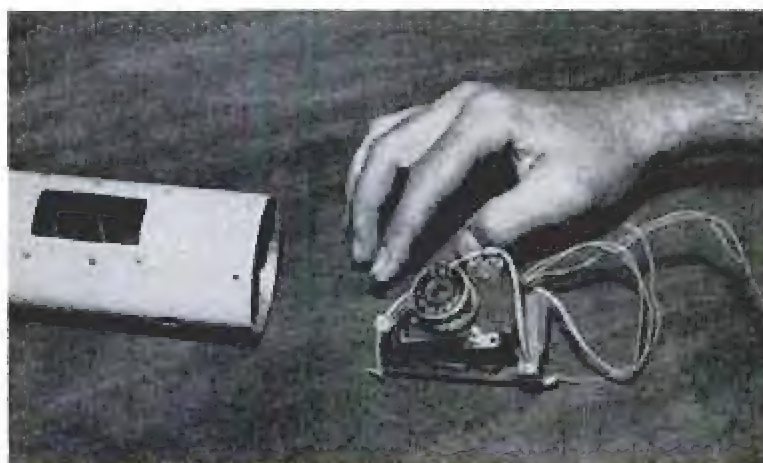


Inside the blockhouse, crewmen watch the rocket launching through slit windows. Rockets are triggered from this building. Recorder, used for research, picks up sounds of launching



Tracking-team member sights falling rocket and records bearing. Location of the buried rocket can be found by triangulation

Miniature camera is inserted in second stage of three-stage rocket. Burning fuel burns away string, clicking the shutter





They Walk On Water!

NOW THE adventurous sportsman can really walk on water! An Austrian ski champion has developed the "skiyak"—an individual "boat" for each foot. Skiyaks, made of aluminum, are carried to the launching area in telescoped sections. There a sportsman assembles the sections and puts on the skiyaks. Special boots fit up over his legs to prevent water from entering the skiyaks. Shoving off into the stream, he balances himself with a double-end paddle, skimming downstream at the speed of the current. In Austria, the fast mountain streams are especially popular for skiyaking, and the sport is attracting many enthusiasts.

Once the skiyaker has donned his pontoon-shaped "shoes," he shoves off into the swirling waters of a stream with only a paddle to keep his balance

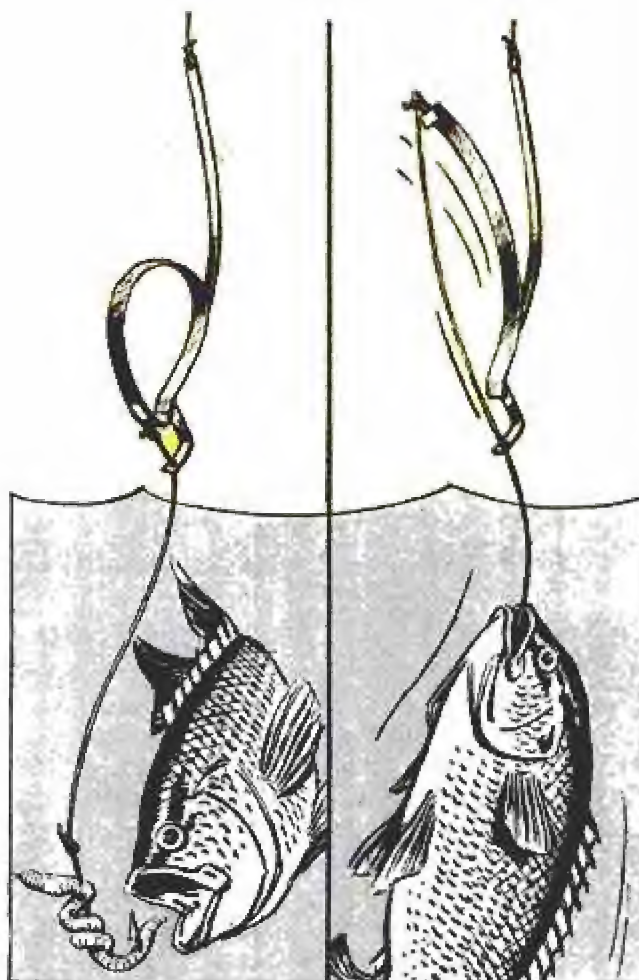
Skiyaks are back-packed to launching area, where they are assembled. Special boots make them watertight





Switch Stops Mower

If your power mower doesn't have a safety switch that will instantly stop the blades, such a device can be added in a few minutes. One switch on the market is attached to the mower handle. If a mower blade hits an obstacle, you touch the switch and short the ignition by grounding the spark plug.



Fish Triggers Own Fate

In using a trigger device for fishing, you bait your hook, then set the trigger by pulling down the top catch of the spring with the leader and hooking it to the bottom catch (left). The nibbling fish triggers the spring and he's jerked onto the hook (right).

Here's a Jet That Takes Off Vertically in Horizontal Position

Bell's X-14 rises straight up from the runway in the conventional horizontal position, then flies forward. The X-14's two jet engines provide more than 3500 pounds

of thrust. For take-off, the jet thrust is deflected downward by venetian blind-type vanes installed behind the engines. It is directed rearward for forward flight.





Helicopter Flies Automatically

Flying during daylight and darkness under instrument-flight conditions, the Navy's new HSS-1N has proved wrong those who said helicopters would never be suited for instrument flying. A major contribution toward this achievement was Sikorsky's development of automatic-stabilization equipment (ASE), an electronic system that relieves the pilot of the necessity of making constant adjustments in helicopter control. The pilot of the HSS-1N can switch on automatic control at 200-foot altitude and 80-knot airspeed.



Loaded Supersonic Jet Propelled Into Air Without Touching Runway

Using the power of its own engine and the kick of a 130,000-pound-thrust rocket, a combat-loaded F-100D Super Sabre roared off a mobile launcher without ever

touching the runway. It accelerated to 275 miles per hour in less than four seconds. The rocket is attached to the underside of the plane's aft fuselage.



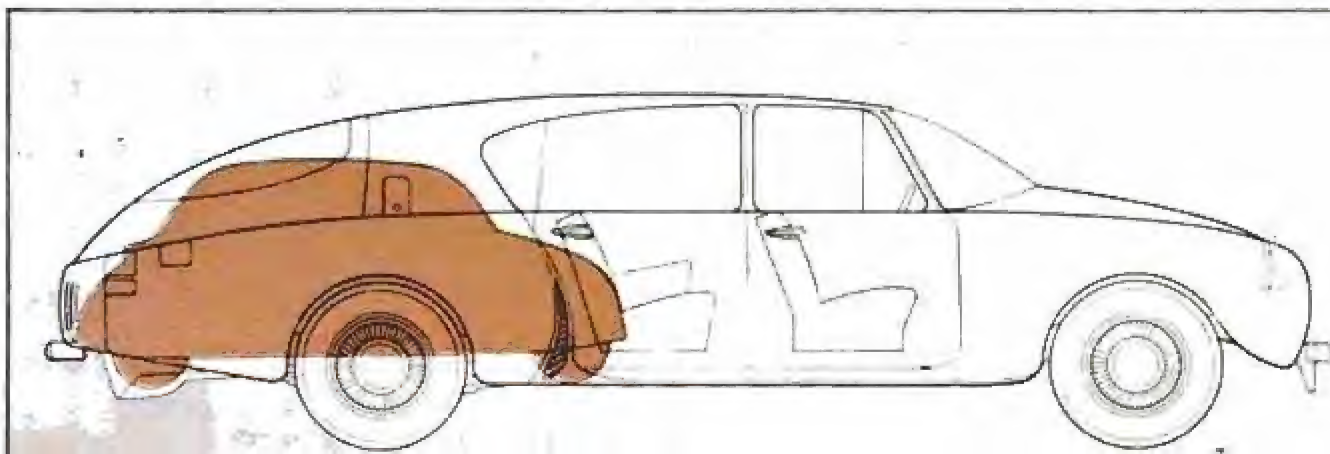
SUB MISSILE PASSES TEST

Polaris, the Navy's intermediate-range ballistic missile, has proved its "pop up" launching method. Inert, with no warhead or propellant, the missile popped up from its underwater launching tube and shot 100 feet into the air. Because Polaris is designed to be launched from a submerged submarine, a launching system had to be found that would protect the submarine from damage or destruction. In the pop-up system, similar to torpedo launching, the missile is loaded into a tube and is then shot upward by compressed air or other gas. It leaves the submarine without damaging thrust and clears the surface of the water before its fiery power is applied.



Big Car? Small Car? You May Get Both

If plans of a British architect materialize, the big-small-car controversy will be solved by compromise—you'll have both. The small car will fit in the trunk of the big luxury car, where it is always ready to scoot around congested areas. You'll drive from city to city in the fast, comfortable limousine and park it at the outskirts, then drive downtown in the midget. No, it's not built yet.





Vauxhall's styling is American. It is a "naturalized" imported car. Owners like this domestic appearance

VAUXHALL OWNERS PRAISE HANDLING AND ECONOMY

COMMENTS BY
ART RAILTON,
PM's AUTO EDITOR

Is it psychological or mechanical? Detroit would love to know. Of course, there is almost as much of America as of England in the Vauxhall. This is or is not an advantage, depending on the point of view.

Detroit is not worried by statements like this. It believes that small-car owners will suddenly "rediscover" America's big cars and marvel at the luxury they've been missing.

In normal traffic and highway driving, you can expect about 27 miles per gallon with the Vauxhall—a fuel cost of just over a penny a mile.

VAUXHALL OWNERS are well-satisfied. But then, so are most foreign-car owners that *PM* has surveyed. This is typical of the breed.

Is it because foreign-car buyers expect less from the smaller cars and, therefore, are more easily satisfied? Is it self-justification for nonconformity? Or is it that these simpler cars are more trouble-free and better built? Who can be certain?

Regardless of the reason, the plain fact is that foreign-car owners surveyed in our Owners Report series are more
→satisfied than owners of domestic makes.

Only one Vauxhall owner rates his car as "Poor" over-all. Such overwhelming approval is unheard of among American cars—even among the most expensive. The only car that has been given fewer "Poor" ratings is Volkswagen, and it got none at all.

First on the Vauxhall owners' list of best-liked features is handling ease with a whopping 69.9 percent mentioning it.

→"It handles easily. Its roadability is unbelievable until you actually drive it. I doubt if I ever will want to drive a bigger car again."—Ohio truck driver.

"Easy to handle in traffic. I really enjoy driving now that I have become used to a standard shift."—Tennessee clerk.

"Pleasant to drive. A sensibly proportioned, intelligently engineered and spirited little car."—Maryland mechanical engineer.

"It's sure handy to be able to make a U-turn in the middle of a street without backing and turning two or three times."—California salesman.

→Second on the best-liked list is economy.

"I'm an average working man with a less than average



POPULAR MECHANICS

OWNERS REPORT

A NATIONWIDE SURVEY

income. The Vauxhall provides the luxury of an American car plus economy."—Ohio factory worker.

"Averaged 27.6 miles per gallon on a round trip from California to Washington, about 1800 miles. Speeds up to 80 miles per hour. Road time: 35 hours."—California bus driver. ←

"This car averaged 28.7 miles per gallon on regular gasoline for 3387 miles. An ideal commuting car. In traffic it does excellent in high, down to 20 miles per hour."—Massachusetts soldier.

"Biggest joy is almost never buying gasoline! Once every couple of hundred miles I buy less than \$2.50 worth of gas. That's fun."—Illinois secretary.

Third among the best-liked features is styling.

"I like its styling very much. It looks similar to American cars only smaller."—Pennsylvania foreman.

"Smart, attractive lines."—New Jersey minister.

"Pretty and conservative. It looks like a car, not a space rocket or a finny monster."—Connecticut housewife. ←

Here Are the Complaints

Although they are generally a satisfied group, the Vauxhall owners have a few gripes. More than a fourth of the owners are entirely content: 28.4 percent making absolutely no complaint at all.

Most frequently mentioned complaint of all is the comparatively slow pickup, the lack of sufficient power for certain traffic conditions.

It is interesting to note that most of the owners who complain about this have had their Vauxhalls a comparatively short length of time (have driven fewer than 3000 miles). ← Among owners who have driven more than 3000 miles, the lack of sufficient power drops to third place on the com-

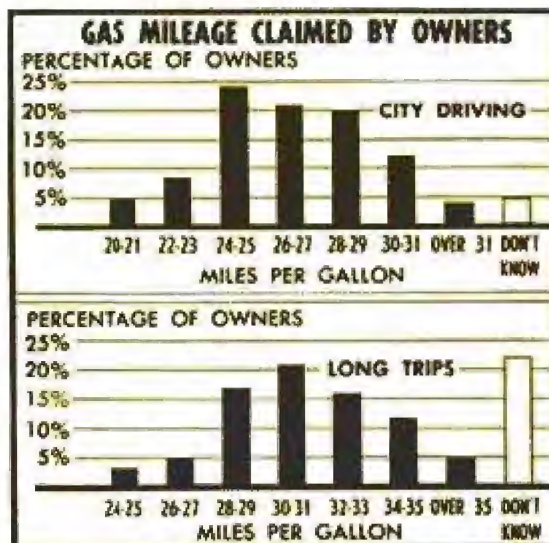
Gas economy is a factor in foreign-car sales, but there's more to the trend than that. After all, on a 1000-mile trip you save only about \$5.

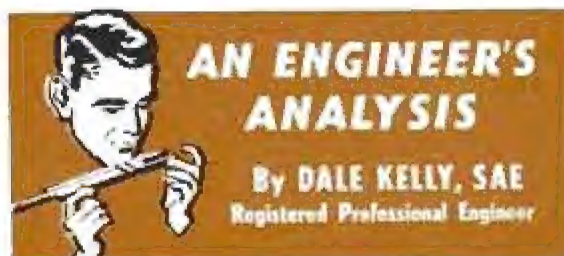
Will the day ever come when people buy cars the way they buy a furnace—just to perform a necessary function with little or no concern for styling? It seems unlikely.

Americans have to learn that a small engine must turn over fast to perform well. We seem to have a humane-society attitude toward engines—as though we feel that it pains an engine to work hard. Nonsense.

Although the rear seat is comfortable (more so than the front seat), it has limited legroom. Interior of the test car was well finished

Most owners say they get from 24 to 29 miles per gallon in city driving





Vauxhall Victor Test Data

MODEL TESTED: Four-door sedan with four-cylinder overhead-valve engine. Handshift three-speed transmission.

Rear-axle ratio: 4.125 to 1. Wheelbase: 98 inches. Tires: 5.60 by 13. Weight: 2214 pounds with gas tank half full (54% on front wheels, 46% on rear).

Mileage on car at time of test: 500 miles. Barometer: 29.1 inches. Temperature: 87 degrees F. Payload: 200 lb.

ACCELERATION TIME FROM STANDING START (in seconds)



Ignition timed for:	0 to 20	0 to 40	0 to 60	0 to 70	1/4 mile
Regular gasoline.....	2.7	10.4	26.5	45.0	23.3

(First gear to 25, second to 45 m.p.h.)

Premium gasoline..... No improvement noted

(Gasoline had following octane ratings by Research method: Regular 90; Premium 97.)

FUEL ECONOMY (miles per gallon)



Ignition timed for:	Steady 30 m.p.h.	Steady 50 m.p.h.	Steady 70 m.p.h.	Traffic Route
Regular gasoline.....	37.3	29.6	20.9	19.5

(In traffic test, car makes 10 full stops per mile and is driven fast enough to average 15 m.p.h.)

ESTIMATED AVERAGE ANNUAL GASOLINE BILL: \$113 for 10,000 miles

(Based on exclusive use of regular gasoline.)

SPEEDOMETER ERROR (miles per hour)



Speedometer reading.....	20	30	40	50	60	70
True speed.....	21	31	40	49.5	59.5	70.5

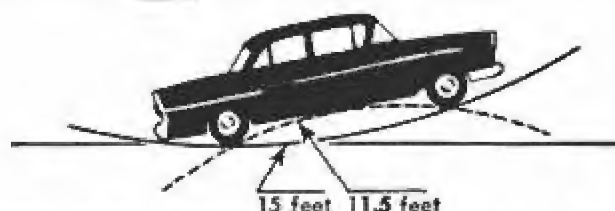
ODOMETER ERROR (miles traveled)

Odometer correct within one-half of one percent.



DRIVER'S VISION

Driver could see part of road 14 feet in front of car, full width of road 16 feet in front of car.



GROUND CLEARANCE (unloaded car)

Worst dip that could be crossed.....15-ft. radius
Worst hump that could be crossed.....11.5-ft. radius
Deepest rut that could be negotiated.....6.5 in.
Curb clearance for door opening.....13 in.

MISCELLANEOUS

STEERING

Steering-wheel turns for 100-ft. circle.....0.50 turn
Curb-to-curb turn-circle diameter.....34.5 feet
Wall-to-wall turn-circle diameter.....36.5 feet
Steering-wheel turns, lock-to-lock.....3.5 turns

CENTER OF GRAVITY: 23.8 inches (unloaded)

TRUNK CAPACITY

9 cartons (one cubic foot each)

WATER RESISTANCE

Splash-pan: No leaks. Brakes, ignition unaffected.

High-pressure test: Tread too narrow for test to be made.

OVER-ALL DIMENSIONS (inches)

Length: 167 Width: 63.5 Height: 59

OBSERVATIONS

Top speed of car is 75 miles per hour.

Speedometer and odometer more accurate than those in any American car tested this year except Cadillac and Imperial.

Hood does not open very high. Anyone working on engine may bump his head if he is not careful. Starting-motor solenoid is so made that, in the not uncommon event of trouble in the starting-switch circuit, the driver can open the hood and operate the solenoid by hand to start the engine.

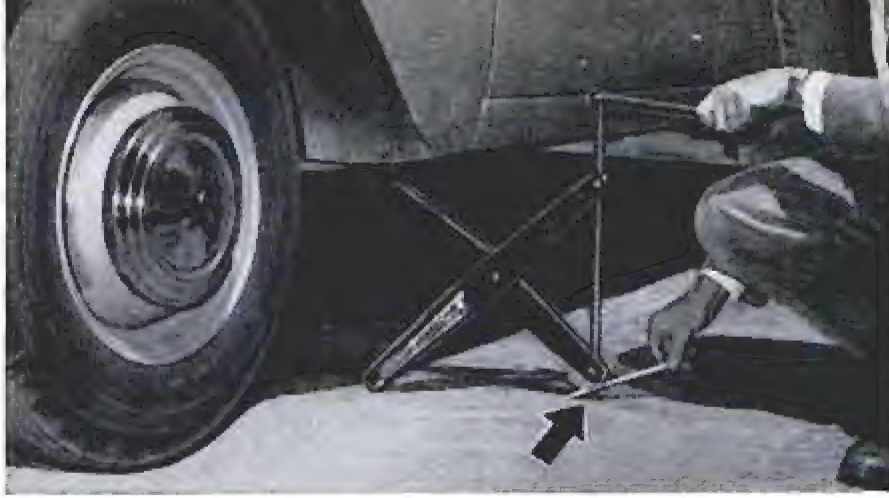
The car has a better-than-average jack, an unusually complete service manual and a set of tools that will be

helpful to the do-it-yourself owner. Also provided is a small supply of touch-up paint.

The front suspension is similar to the American ball-joint design, but the lower control arm, which carries the weight of the car, has a king pin for steering and horizontal pins to accommodate the up and down motion instead of a ball joint. This is probably more expensive than two ball joints and should hold up better.

Transmission is noisy in reverse.

Gasoline tank holds 9.7 gallons. Gauge read empty when the tank held 1 1/2 gallons.



Like many European cars, the Vauxhall has an excellent jack arrangement. Four special jacking points are built into body. Jack stands on only one leg, other leg (arrow) is in the air

plaint list. This more experienced group lists poor workmanship first among the complaints and uncomfortable interiors (seats and legroom) as second.

"It could perhaps have just a bit more power for mountains. Fine for city and level highways."—Nevada airline employee.

"Should have four forward speeds. On long steep grades, not enough power in third, too much in second."—New Jersey civil engineer.

"Needs a little more horsepower for better acceleration."—Indiana cost engineer.

"I'd like a little more power. From my driveway I have to start up a steep mile-long hill. The Vauxhall will accelerate up it in second, but slows down in third."—Connecticut housewife.

Second on the complaint list (first among those who have driven the Vauxhall over 3000 miles) is poor workmanship, as these quotations describe:

"Poor-quality paint job. Inferior plating on cast parts. Interior finishing sloppy and of poor quality."—Michigan engineer.

"Delivered before proper servicing. If this make is an example of foreign workmanship, it is no better than our own."—Washington, D. C., owner.

"Workmanship appears slipshod and careless."—Missouri supervisor.

Third on the list of complaints involves the clutch, brake and accelerator pedals. These are, owners say, too close together.

"Brake and clutch pedals too small and too close together. Brake pedal too close to accelerator, accelerator pedal too

Four speeds might solve the problem, but Americans tend to "lug" around in high—something you can't do with a four-speed gearbox.

Workmanship on the test Vauxhalls was excellent with no evidence of undue haste. But borrowed test cars are carefully checked by the company, which is not always true of customers' cars.

After 500 miles or so, you get used to the narrow, closely spaced pedals, but initially this arrangement may be hazardous. You might depress accelerator along with brake pedal in an emergency. Pedals are very small, feel flimsy underfoot.



Unlike many European cars, the Vauxhall has a roomy luggage compartment. It is big enough for the luggage of a family of four on a normal vacation trip

Like a stylist's afterthought, the heater is suspended beneath the instrument panel. It moves a large volume of air and makes lots of noise while doing it



straight up. It is not comfortable."—Texas bookkeeper.
 "I bent the clutch and brake pedals to the left to provide clearance."—New Jersey owner.

Suggestions to the Industry

Vauxhall buyers are the malcontents, perhaps. They are the people who are turning away from the domestic automobiles. Why? What is their opinion of the American car and what suggestions can they offer for the industry?

→ First, they say, Detroit should produce a more economical car; second, a smaller car; third, horsepower should be reduced, and fourth, prices should be cut.

Here are some quotations of suggestions the Vauxhall buyers offer to Detroit:

"I would prefer a domestic-made car, but not of the size and cost now offered the public. Make economical and safe cars over here and I will buy one."—Massachusetts college supervisor.

→ "I'm probably one of the proudest and happiest car owners in America. I found everything I wanted in a car when I got a Vauxhall. What I save in monthly operating expense just about makes my monthly payment."—Pennsylvania salesman.

"Detroit should bring the price of its cars down. It could be done if it stops featuring several engines, innumerable body styles and paint combinations, trim and interior combinations."—New York mathematician.

(Continued to page 246)

How many times have you heard these requests? Detroit hears them too, but until 1960 it must make believe it doesn't.

When salesmen start driving around in the small imports, it's real cause for concern in Detroit.

SUMMARY OF VAUXHALL OWNERS' OPINIONS

OVER-ALL RATING: **Excellent 80.8%** **Average 18.8%** **Poor 0.4%**

Best-liked features

Handling ease	69.9%
Economy of operation	56.4%
Exterior styling	28.6%
Riding comfort	26.4%
Parking ease	23.4%
Roominess	17.8%
Performance	11.9%

Most-frequent complaints

None at all	28.4%
Insufficient power	14.9%
Poor workmanship	13.5%
Pedals poorly placed	10.0%
Hard to shift	9.5%
Uncomfortable, cramped	9.0%
Poor dealer service	8.0%
Not enough gas economy	7.5%

Had trouble with engine?

No trouble	80.2%
Some trouble	18.3%
Considerable trouble	1.5%

What was engine trouble?

Oil leaks	4.5%
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Carburetor	4.0%
Timing	3.0%
Ignition	2.5%

How is dealer service?

Excellent	51.0%
Average	37.9%
Poor	11.1%

Would buy from him again?

Yes, would	54.9%
No, would not	13.0%
Undecided, no answer	32.1%

Difficulty getting parts?

Yes, have had	22.8%
No, have not	51.4%
No need, no answer	25.8%

Buy foreign car again?

Yes, would buy again	85.6%
No, would not	2.5%
Undecided, no answer	11.9%

What make was traded?

Pontiac	16.9%
Chevrolet	15.9%
Ford	9.9%
Plymouth	9.0%

Buick	4.0%
All other U.S. cars	21.0%
Foreign make	4.5%
No trade	18.8%

What make will buy next?

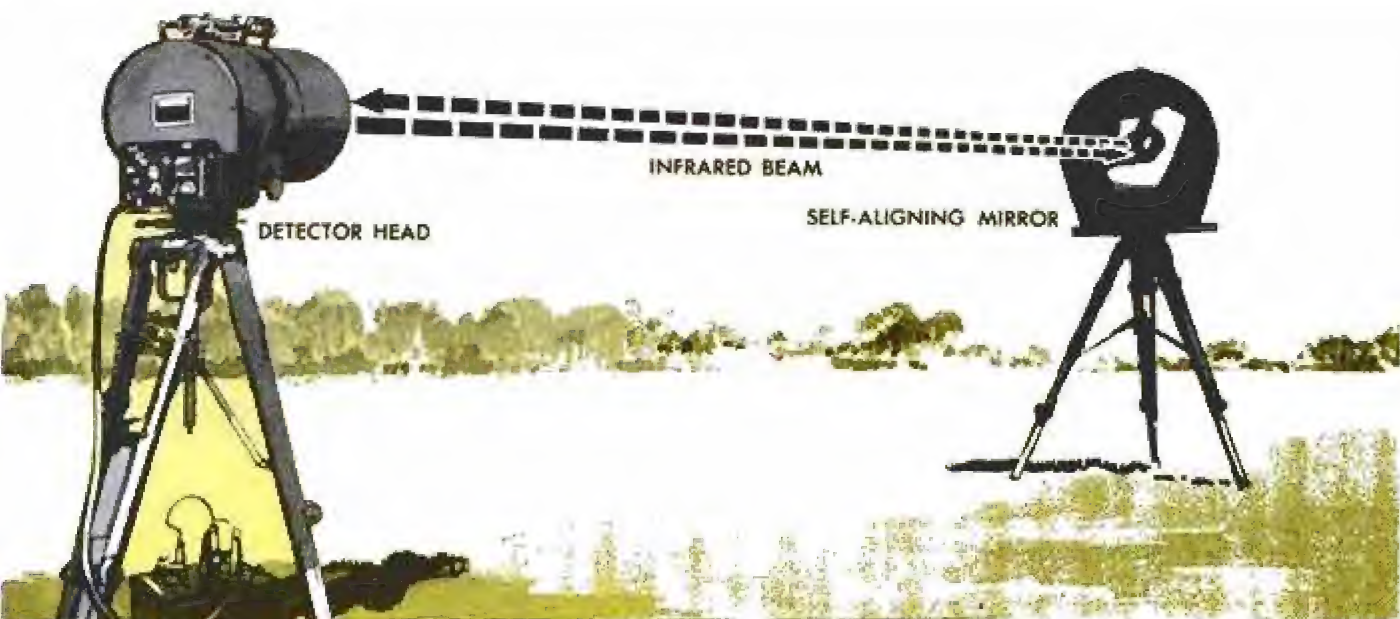
Another Vauxhall	35.6%
Another foreign make	13.9%
Rambler	3.0%
Pontiac	1.0%
Other GM make	2.5%
Ford Motor make	1.5%
Chrysler Corp. make	1.0%
Undecided, no answer	41.5%

What other car owned?

None, Vauxhall only car	63.3%
Pontiac	8.0%
Other GM make	14.5%
Ford Motor make	5.0%
Chrysler Corp. make	4.5%
Other U. S. make	4.5%
Another foreign car	2.5%

Approve U. S. styling trend?

Yes, approve	48.0%
No, do not	46.0%
No answer	6.0%



Detector transmits infrared beam, analyzes reflected beam, trips alarm if certain chemicals are detected



Chemicals in the Air Detected by Infrared

One droplet of a chemical evaporating in a space the size of a living room could be detected by a new alarm system, according to the Army. The device, called LOPAIR, for long-path infrared, also can be used for industrial air-pollution studies. It consists of two units, a detector head and a self-aligning mirror. A tiny amount of contaminant, even a colorless and invisible chemical-warfare agent, would trip the alarm by passing through the infrared beam. The detector head transmits the beam and analyzes the infrared light returned by the mirror.

Nitrogen Gas Preserves Kansas Water Pipeline for Future Droughts



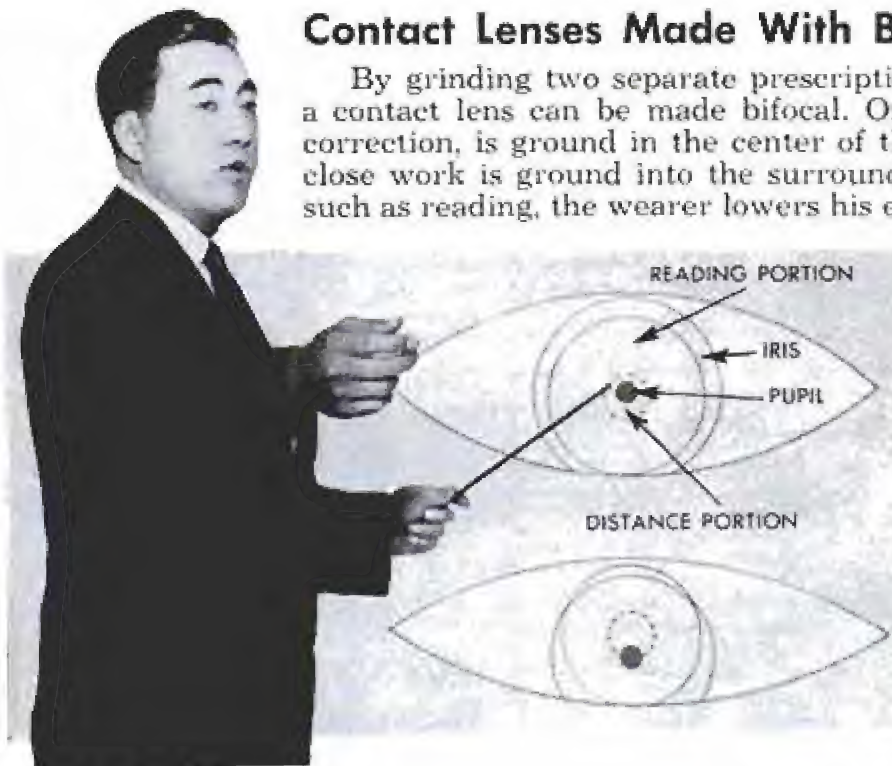
More than a quarter million cubic feet of nitrogen gas has been pumped into a water pipeline in Kansas to prevent internal corrosion while the line is not in use. The 32-mile pipeline was laid from the Arkansas River to El Dorado, Kans., during a severe drought. The communities of Augusta and El Dorado were faced with the possibility of being completely without water until the emergency pipeline was completed. Although the emergency is over, the pipeline is maintained for possible future water shortages. It took 50 hours to fill the line with nitrogen by pumping the gas from a truck. The truck was connected to valves at Rose Hill, El Dorado and Augusta.

Contact Lenses Made With Bifocal Prescriptions

By grinding two separate prescriptions into the outside surface, a contact lens can be made bifocal. One prescription, for distance correction, is ground in the center of the lens. The prescription for close work is ground into the surrounding area. To do close work, such as reading, the wearer lowers his eyes. The contact lens follows

the eye downward until the lens meets the lower eyelid. This shifts the lens upward so that the pupil is beneath the reading portion. When the wearer looks up again, he simply blinks and the distance portion centers itself over the pupil. The bifocal contact lens is about the size of an aspirin tablet.

Drawings show bifocal contact lens in distance position, top, and reading position, bottom



Electronic Draftsman Makes Graphs and Drawings

Architectural and engineering drawings, as well as business graphs, can be plotted automatically by a machine that "reads" data on punched cards and tapes. Fifty times faster than manual-plotting methods, the electronic device needs less than two seconds to translate all the coded data on a punched card, relate it to data on a preceding card and draw a line between two points. The automatic draftsman is expected to aid highway builders because it can draw cross-sections of highways and surrounding terrain from field engineers' calculations, showing the amount of cut-and-fill work required.



Rockets Drop Aluminum Chaff To Measure Wind Behavior

Confetti-like aluminum chaff can be scattered by rockets to provide scientists with information about wind behavior at high altitudes. The information is needed in delivering intercontinental ballistic missiles on target, and in developing new weather-forecasting theories. The rockets release the small pieces of aluminum more than 50 miles above the earth. Radar tracks the chaff and produces a quick and accurate wind profile. Platforms for launching the rockets are mobile.





With oil-drilling rigs in background, Navajo women card wool, twist yarn, weave rugs in tribal tradition

TREASURE HUNT IN NAVAJO LAND

Oil-drilling rigs crowd primitive mud houses in a dusty desert basin already rich in uranium ore. And the once impoverished Indians who own the land may become one of the wealthiest tribes

By Rafe Gibbs

MODERN TOOLS and men of science are again making Paradox Basin one of the most aptly named areas in the nation. The basin, which sprawls over the famed Four Corners where Utah, Colorado, Arizona and New Mexico meet, is sage-spotted desert land about as worthless-looking as a rusty horseshoe. Shortly after World War II, however, the basin bore out its name by giving up rich deposits of uranium ore. Now it is producing oil in a strike that may be the biggest.

Because of the remoteness of the area, it costs about \$150,000 to sink a well, compared with the national average of \$77,485, but the producers say that the quality of crude being found justifies the expense. The quantity of production, too, is high. Carter Oil Company's McElmo Creek well alone is producing 2330 barrels a day.

"Our company's pride and joy," said a Carter oilman. He might have added that a well with half that production would look good on a stockholder's report.



Where grass is thin and terrain resembles surface of moon, petroleum companies are making big oil strikes

Wildcatting in untried areas of Paradox Basin has been highly successful. On the average in the industry, only one wildcat in seven strikes oil or gas. But, of six recent wildcats Texaco drilled in the basin, four were considered good producers.

Bidding for oil leases has been spirited. A combine of Ohio Oil, Sun Oil and Pure Oil companies bid \$7,941,000 for a 2500-acre lease.

Texaco has some 30 top-notch producing wells in the Four Corners area, and there are many other companies with multiple producers. Altogether, about 25 companies are actively operating in the basin.

In this land the grass is lean, but the

sheep of the lonely Navajo herders are astonishingly fat. Most of the basin is on the Navajo Reservation and, with oil, the Navajos, who were once one of the country's poorest Indian tribes, may become one of the wealthiest.

Although the basin is now a desert, it was once covered by a great sea. An old Navajo, told that he was living on the floor of a vanished sea, shrugged: "Perhaps the wind dried up the waters."

The wind blows a lot in the basin, all right. Sometimes there seems to be more dirt in the air than on the ground. Even when it is dusty, however, you can see 40 or 50 miles.

Map shows location of oil fields. Pipeline (shown by black line) will carry oil to California refineries



Outside rear-view mirror from car is used to inspect welding before the pipe is lowered into ditch

The inclination of many ancient peoples has been to build their homes on hilltops for protection. But not the Navajos. They avoid the hilltops—for protection. The hilltops are where “the wind spirits dwell, and they cause headaches.”

When the atom bomb was developed at the end of World War II, prospectors fanned out through the Four Corners area and made significant discoveries of uranium-bearing ore. A news dispatch then predicted that “this area may some day be producing half the world supply of uranium.” But the prediction had already come true, in 1898, and had held good for 30 years, until the discovery of radioactive ores in the Belgian Congo.

The person responsible for the early mass-production of uranium-bearing ore never saw the basin. She was Mme. Marie Curie of France.

Carnotite, rich in uranium, was first mined in the basin in 1881—but the miners were interested only in the small amounts of gold they got from the ore. After the Smithsonian Institution discovered the ore contained

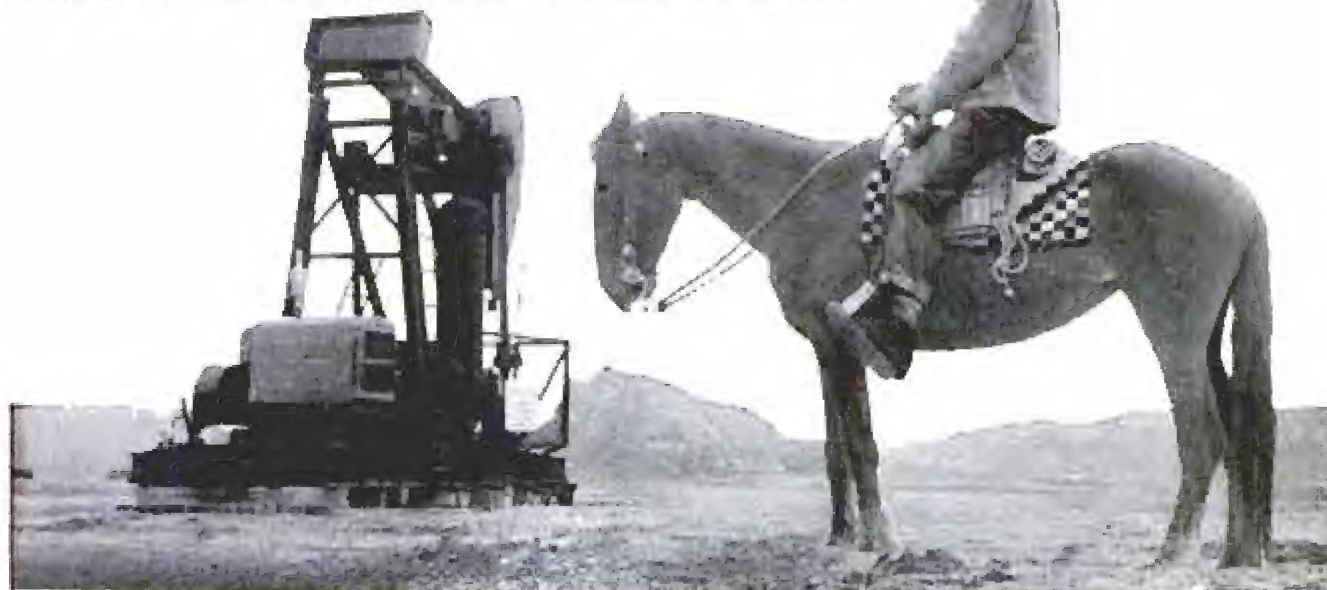


Primitive and modern worlds coexist in Paradox Basin where drilling supervisor parks near Indian mud hogan while using mobile radiophone



Rising in the sky like an Indian smoke signal is the plume from a blast marking the test site for another oil well in the sage-spotted desert

Navajo on his pony pauses alongside a well that is equipped with a pumping rig. Tribe has received millions of dollars from oil leases





Besides income from oil-company leases of land, many of the Indians earn money from oil-field jobs



Drillers putting down well at Paradox Basin location add another length of drill pipe to the "string"

uranium, several tons were shipped by scientists to the School of Mines in Paris. The ore was delivered to Madame Curie and used by her in experiments that resulted in the extraction of radium.

In 1879, E. L. Goodridge had discovered in the area "streams of oil coming from loose boulders." Some years later, Goodridge came back with a drilling rig, and struck a gusher throwing oil 70 feet high. But the well soon proved to be mostly gush, and was abandoned.

For the modern oil seekers there were no flowing streams, but there were structural surface signs to guide them. And out of this fact grew a paradox in the basin that is paying off.

Ordinarily oil companies in their explo-

rations depend heavily on subsurface studies. Being used extensively in Paradox Basin today are seismographs to measure shock waves traveling downward into the earth. But, in deciding to drill the big strike's first well in 1956, a pioneering company did so without benefit of seismography! The surface signs observed by the company's geologists said there was oil below. They drilled. There was.

The quiet of the basin, in a 20-mile long, egg-shaped area known as the Aneth-Is-may, was quickly and frequently broken by the rumble of trucks carrying instruments, drilling rigs, pipes and casing.

Ordinarily, you can move fastest in a motor vehicle when the air pressure of

(Continued to page 226)

Once well begins to flow, drilling rig is dismantled and moved. A small fence is erected around wellhead
Photos courtesy of Texas and Shell Oil Company

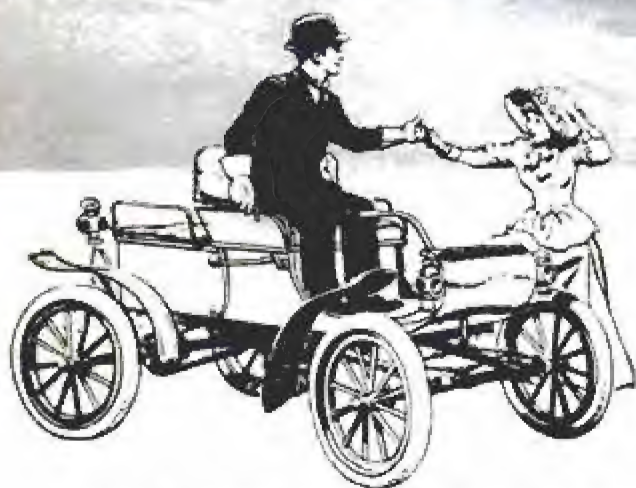




Push-Button Camp Wagon

ON THE ROAD, the "push-button camper" appears to be just another station wagon carrying an aluminum boat. But when the driver pulls into a parking area and pushes a button, the "boat" is lifted up and over the side. Touch another button and an auto-top tent opens over a double bed already made-up and equipped with a reading lamp. A third button causes a compact kitchen unit to slide out on the tailgate. The unit includes a sink with hot and cold running water, a two-burner stove and a refrigerator. Still another button thrusts out a canvas canopy to shade the kitchen. The push-button camper was developed by the Ford Motor Company's publications department for experimental purposes.





For economy, maneuverability and visibility in a pick-up, you can't beat the "new" American Air Products' 1901 Olds

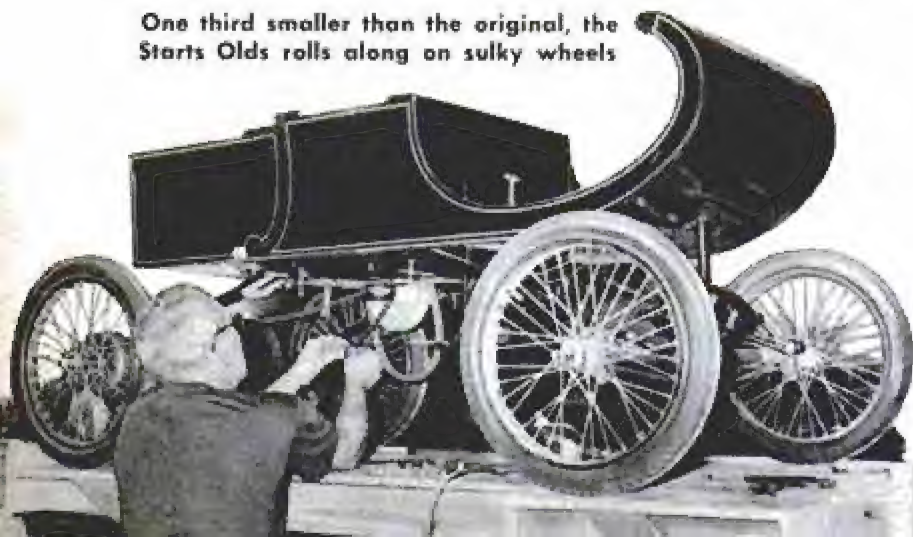
THE 1901 OLDS IS BOOMING

By George X. Sand

Here's how the Olds looked when it really was new

THIS PROBABLY will not alarm Detroit too much. The competition is not very threatening to the shiny new models coming out of the Motor City—but there's a tiny boom going on in 1901 models of the "Merry Oldsmobile."

One third smaller than the original, the Starts Olds rolls along on sulky wheels



Fort Lauderdale, Fla., is the "motor city" whence come two versions of the 1901 curved-dash Olds. A firm in Canton, Ohio, is preparing to put in its bid for the business of antique lovers with a replica of the 1903 Olds, complete with tiller, 4.8 horsepower engine and nostalgic bulb horn.

American Air Products at Fort Lauderdale is turning out full-size, 93-inch copies of the '01 Olds. Capt. Al Starts of Fort Lauderdale, popular sightseeing-boat operator and inventor, is the impresario of a somewhat smaller but authentic copy of the same car.

John McGrath is head of American Air, a concern which also builds portable iron lungs. Like Al Starts, he decided to

build one of the ancient cars for personal use after falling in love with an original model owned by James Melton, the singer and collector of antique autos. Original parts were no longer available, so both McGrath and Starts had to "tool up" to start their production. When the two private automobiles appeared on the city streets, folks wanted to buy. Starts and McGrath decided to build more, and Starts sold 12 the first time he parked a working model beside the ticket booth where he docks his tourist boat.

The American Air version is "standard" size, 93 inches long. It goes 35 miles per hour, and 60 miles on a gallon of gas. It is powered by a 4-horsepower, 4-cycle, single cylinder L-head air-cooled Clinton engine. This flea-size powerhouse employs ball bearings, but with splash-type lubrication. It boasts a $2\frac{15}{32}$ -inch bore and $2\frac{1}{8}$ -inch stroke. A Cushman gearbox offers two forward speeds and reverse. A canvas "all weather" top is optional. Price: \$1095, f.o.b. Fort Lauderdale.

All three cars seat two persons and have the modern convenience of self-starters. They have marineplywood bodies mounted on steel frames and springs.

"Nope, we're not crazy," defends Al Starts. "In fact, we can't turn them out fast enough. Car dealers and shopkeepers find it excellent advertising to use them as delivery cars. Housewives love the novelty of shopping or driving to the beach in these cute little gas buggies. They are much safer than scooters, and much easier to park than conventional cars. Old people buy these 'Merry Olds' because they revive memories of youthful days."

The Starts car is scaled about one third smaller than the original Oldsmobile. It has a 54-inch axle, weighs 275 pounds and sells for \$895 f.o.b. (Air freight to New York City from Florida is \$50; no crating required.)

Its 3-horsepower, 4-cycle Continental gas engine (built originally under Government contract for scooter use) provides speeds up to 40 miles per hour. The engine, like the four stainless-steel sulky

(Continued to page 244)

Steering is by tiller. The horn blows if you squeeze it. Lights are electric, but look like oil lamps



How simple can a car be? The Starts company produces these 1901 automobiles on an "assembly line" (background) in Florida

Ohio's version of the 1903 curved-dash Olds sports mudguards. It sells for \$1095 or can be bought in kit form for only \$895





Powered Wheelbarrow Climbs Mountain

Maintenance crews of the United States Forest Service now get an assist from gasoline-powered wheelbarrows when moving heavy loads of cement and rocks up narrow mountain trails. The powered wheelbarrows were introduced in Kings Canyon National Park, in California, after a severe winter had caused considerable damage to trails, bridges and other facilities. The crews were able to speed up repair work with less strain on the workers with gas-powered wheelbarrows. The equipment consists of a lightweight steel body with a 2½-horsepower engine mounted at the rear. It will carry loads of 250 pounds up steep trails.



Solar Cells Power Hearing Aid

Silicon solar cells, which make electricity from sunlight, furnish power for a new type of hearing aid. Built into eyeglass frames, the cells need only a small amount of sunlight each day to operate the hearing apparatus. When light is poor, a battery takes over.

Sikorsky Helicopter Lands On Water—or Anywhere

Built with a flying-boat type of hull, the Sikorsky S-62 can take off and sit down on water, ice, snow and swamp as well as land. The V-shaped bottom of the fuselage is designed to cushion impacts when sitting down on water and to throw spray outwards and down. The floats house the landing gear and resist pitching and rolling while the helicopter rests on the water.

Looking more like a flying boat than a helicopter, the versatile S-62 has blisters down near the hull line, giving the pilot excellent downward visibility



YOU WON'T BELIEVE it. Not until you see it, that is. The unbelievable switch in General Motors' automotive image. A revolution has occurred.

The 1959 General Motors styling is completely out of character—the past is forgotten. The slate is wiped clean.

It represents the sharpest break with tradition since Chrysler dumped its shorter-on-the-outside models in 1955.

Replacing GM's historically prosperous, well-fed, overstuffed look is a sleek, crisp airiness that puts GM right into the middle of the 20th century. It's the difference between overstuffed furniture and Danish modern.

Actually, there is comparatively little that is original in the new GM look. By combining the best of Chrysler and Ford with a few new touches, GM has made its previous models as out of date as the four-poster bed.

Last December this column suggested that GM might be getting help from Italian stylists—specifically Farina. GM denied it then and still does, but there's a lot of Italy in its new cars. The 1959 Buick may even please the Society of Industrial Engineers, the most vocal of all Detroit's critics.

A Big Year for GM

Longer and lower, all GM '59 cars have a lightness, a fleetness that belies their bigness. They drive better, too. The balance is better. They feel more alive, more agile. It should be a great year for the Giant.

But there is no move toward more practical designs at the moment. These cars are bigger and so are the engines. Cars may not be more practical, but they're beautiful. They may not help your budget, but they'll sure lift your morale.

What will this new GM personality do to Chrysler and Ford? If GM sells over 50 percent of the market with old-fashioned styling (as it is this year), what will it sell when it goes modern?

Another General Motors bombshell is the exclusive use of acrylic lacquer on all models. This new plastic paint (used on about 25 percent of the GM cars in 1958), the corporation claims, will make waxing and polishing unnecessary forever. But it's unlikely that the public will quickly give up its Sunday recreation of washing and polishing cars. Polishing a new car is as much fun for some as driving it—and lots cheaper. People rarely polish old cars (which need it) and love to polish new cars (which don't) and they probably will continue to, despite this new paint.

What's Left for '60?

You're probably not interested in 1960, not having seen the 1959 cars yet, but the



By Art Railton

pressure has relaxed in the race for the rear-axle transmission. Earlier, the target was 1960; now it seems to be 1961.

Along with the rear-axle-mounted transmission, you can expect General Motors to replace its Hydra-Matic in 1961. The new job will undoubtedly be a torque converter rather than the four-speed-shift-itself-gearbox variety. Cadillac will probably get its new engine at the same time, although it may be out by 1960.

Chrysler will have some big surprises in 1960. One just might be a transistorized ignition system and, perhaps, the long-forecast central hydraulic system. One thing appears certain—the 1960 Chrysler styling will do to the industry what its 1957 design did with its emphatic tailfins.

A revolution may be starting in the Motor City. There's a British taxicab on test there—an Austin four-cylinder diesel cab right from the streets of London.

How's it doing? In the first month, its over-all fuel economy was 28 miles per gallon of diesel fuel (domestic cabs get from 8 to 10 miles per gallon of gasoline). Maintenance is minimized. It is expected to go 100,000 miles without overhaul and to last at least 10 years in daily service. The drivers love it. They're less tired, get no backache thanks to an upright seat. It U-turns anywhere. The passengers praise its ease of entry, roominess, seat comfort and privacy. It costs \$1000 more than a U.S. cab, but operating costs are expected to offset this initial handicap.

If the foreign cars start cutting into the cab business (there are Mercedes cabs operating in New York City), what next?

There will be one dream car at the GM Motorama in October. But it won't compete against the 1959 models. It will be an engineering car of the future showing how Detroit will soon eliminate humans from the chores of driving. Soon all you'll have to do is to make the monthly payments. You won't even have the fun of driving the family car!



Oriental influence is reflected in carvings by Dr. Schwartz who obtained many designs during travels



Photos by Three Lions

Most of the work of the dentist-sculptor is in pure ivory which is sliced off a tusk with his bandsaw

A Dentist Turns Sculptor

AFTER A BUSY DAY of drilling teeth, Dr. J. R. Schwartz, a New York City dentist, relaxes by using dental drills to sculpture ivory figures. A comparatively soft material, the ivory is easily worked by the small drill bits. The drill equipment in Dr. Schwartz' home workshop is similar to that used in most dental offices. By using the different types of bits, he ob-

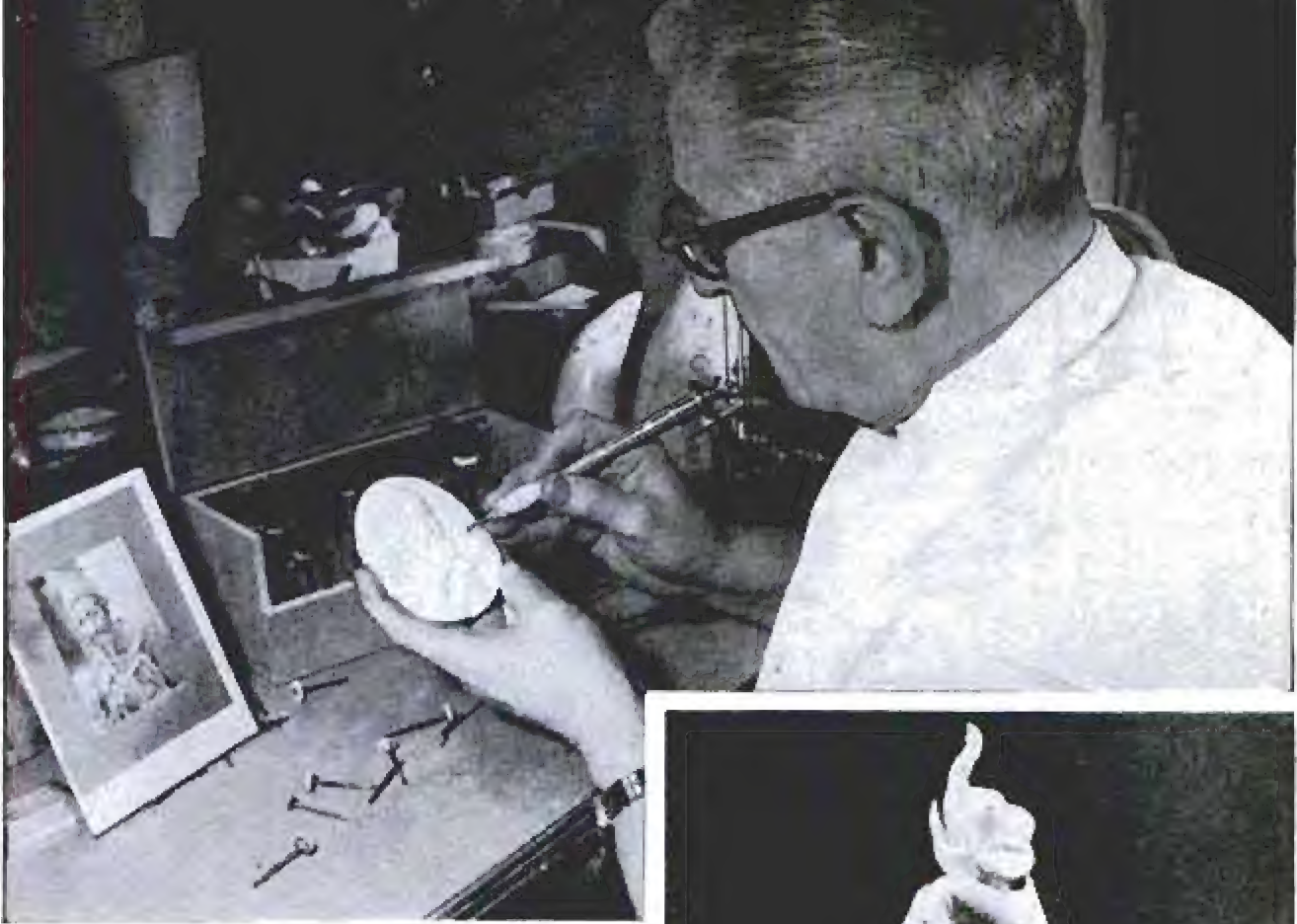
tains varied textural effects. Occasionally, he uses an entire tusk of ivory for a figure. But more often he cuts a slice from the tusk with a bandsaw. And he sketches an outline of his project on the flat surface of the ivory before he begins carving it. In addition to his work with ivory tusk, Dr. Schwartz has carved tiny but elaborate art objects from whale teeth. ★ ★ ★

Replica of Rodin's famous statue was carved from a whale's tooth. Next to it is an uncarved whale's tooth



Incredibly delicate work of Dr. Schwartz is shown in tiny forms carved within forms from solid ivory

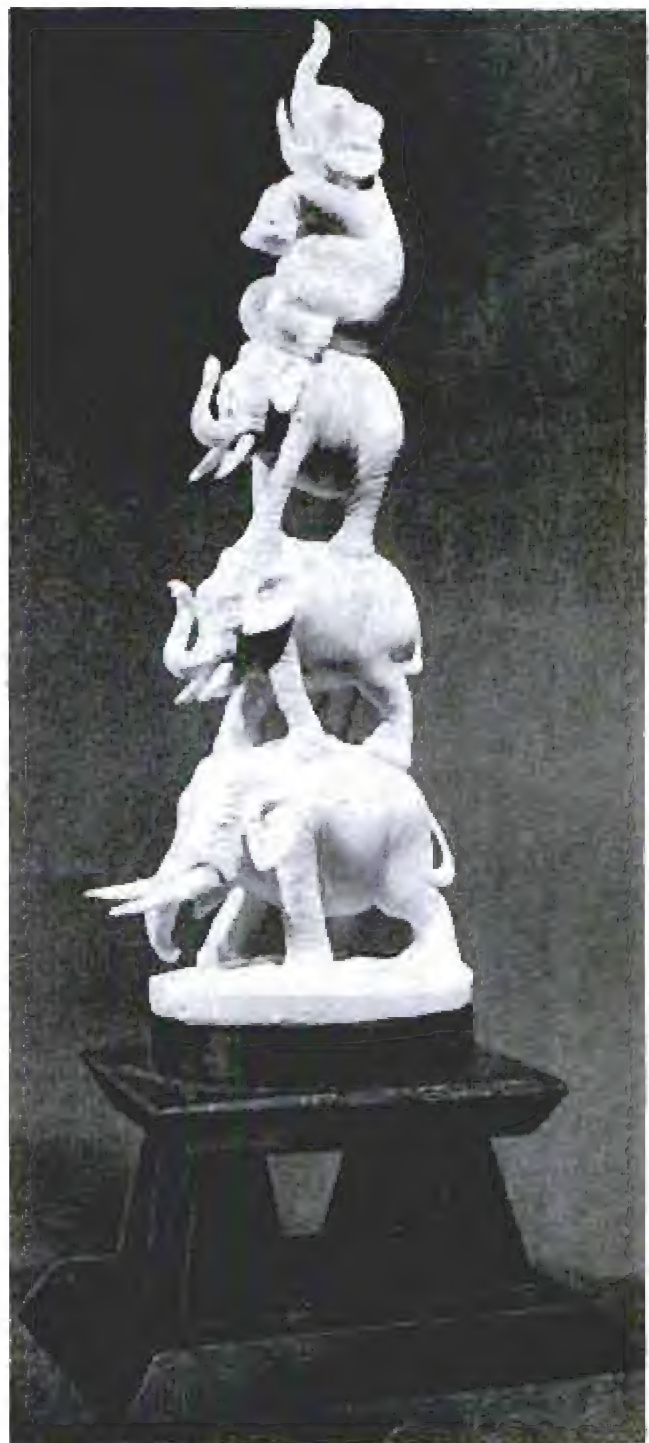




Dr. Schwartz, using different drill bits for varied textures, carves a face on a slice of tusk. Finished portrait in ivory will be that of man in the photo

The pyramid of elephants, at right, was carved by Dr. Schwartz from a solid tusk of ivory. The dentist uses a standard set of drills for his unusual hobby

At work on replica of faces of American presidents, originally carved in rock on Mount Rushmore, S. D., Dr. Schwartz manipulates small drill with finesse



Keeping up with the ATOM

YOUR WRIST WATCH may be exposing you to a significantly high level of radiation. That is the warning of Dr. J. L. Haybittle of the Radiotherapeutic Centre at Addenbrooke's Hospital in England.

Dr. Haybittle borrowed luminous-dial watches from friends and checked them for radiation. They ranged in radium content up to 2.2 microcuries. Assuming that such a watch is worn 16 hours a day, Dr. Haybittle says, the skin would receive nearly two thirds the permissible level of radiation.

Should such watches become more popular, he warns, they would be second only to diagnostic X rays in the amount of radiation they contribute to the gonads.

☆☆☆

NUCLEAR NOTES: Bones of babies born in the last six years receive on the average up to five percent more radiation because of fallout than from natural radiation alone. . . . A new high-intensity food irradiator for the Army will contain more radioactive cobalt than all such cobalt now in use in the country. . . . As a result of the successful underground atom-bomb test, the AEC has received eight concrete proposals for industrial applications of such blasts. . . . Nematodes, tiny wormlike parasites of plants, are so resistant to radiation they might be the sole survivors of atomic war, say Department of Agriculture scientists.



YOU'RE LOOKING at a block of ice which is glowing like a big light bulb. The ice gives off a visible glow under the impact of two-million-volt electrons from a high-voltage Van de Graaff accelerator. Westinghouse scientists use the glowing block of ice to demonstrate a new radiation detector which can detect a similar glow in ordinary water and measure the intensity of radiation causing the glow. The heart of the instrument is an "electric eye."

☆☆☆

NUCLEAR QUOTES: "We are on the verge of a breakthrough apparently in conversion of heat through thermoelectric couples. We should have something definite on this in a matter of three years."—Rear Adm. A. M. Morgan, Bureau of Ships. . . . "It will not be long in my judgment before we shall witness nuclear explosives being used in situations . . . where conventional explosives are not practical. The mining, petroleum and engineering fields will begin to use a great revolutionary new tool."—Lewis L. Strauss, former chairman, AEC. . . . "I see a real danger in that the rate of basic discoveries is not keeping pace with the rate of utilization, and from a long-range point of view, I am afraid that our intellectual gas tank is beginning to run dry."—Dr. Willard F. Libby, Commissioner, AEC.

☆☆☆

ATOMIC SCIENCE is helping preserve a relic of the Bronze Age at left. The huge 45-ton slab is one of the toppled stones at the ancient temple of Stonehenge in England. Envelopes containing film were placed atop the slab. Radioactive sodium was introduced beneath the stone. Gamma rays penetrated the slab to expose the film, revealing any cracks that might prevent the stone from being restored to position.



Kit Converts Tube Into Boat

Children can transform an ordinary inner tube into a miniature boat with a wooden deck and keel that fit around the tube. The small boater sits astride the keel and maneuvers with a double-end paddle. The kit includes a mast, which fits into a socket on the deck, and a sail. With these parts in place the tube is converted into a miniature sailboat.



Miniature Battery Pack Has Enough Power to Fire 35 Flashbulbs

Small enough to slip inside a coat pocket, a pint-size battery pack has enough power to fire as many as 35 flashbulbs wired in series. It uses two 22½-volt batteries and weighs only six ounces. A matching unit of the same size and weighing even less (only 4½ ounces) is an electric eye that will fire flashbulbs or electronic flash units. It is powered by a 15-volt battery. When

the two units are mounted together, the combination becomes a self-contained slave-lamp control actuated by the flash on the camera, capable of setting off one or more extension lights. A small hole in the center of the remote-control unit "sees" the flash of the camera-mounted light and fires the others. The eye can be mounted separately from the extension lamps.



EVERYBODY IS

By John C. Green

DIRECTOR OF THE OFFICE OF TECHNICAL SERVICES
AND EXECUTIVE DIRECTOR OF THE NATIONAL INVENTORS
COUNCIL, U. S. DEPARTMENT OF COMMERCE

THE NOTION that modern invention comes exclusively from richly endowed laboratories peopled with white-jacketed teams of bright young men with doctorates is so prevalent that many a potential inventive genius gives up before he gets started. Education and experience are, of course, important, but the truth is that we cannot create inventive genius with a scholarship fund. The invention of the wheel preceded M.I.T. by thousands of years. The formal education of Thomas Edison was limited to three months in the public schools of Port Huron, Mich.

It is also wrong to assume that great invention is dependent upon great expenditure. Some years ago a distinguished American astronomer received a Congressional grant to enable him to more accurately measure the speed of light. While he was so engaged, a young instructor at Annapolis named Albert A. Michelson clocked the speed of light with astounding accuracy. He had no appropriation and he didn't need one. The instrument he used cost him \$10 to invent and build.

In the last 18 years, since I first became executive director of the National Inventors Council, I have sifted through thousands of descriptions of inventions which might be of use to the armed services. I have been amazed at the number of clever and useful ideas submitted by laymen without technical training or degrees of any kind.

During World War II, the government spent millions to help scientists create and build a new type of proximity fuse, a device that will explode a bomb or projectile when it gets near enough to its target to destroy it. The fuse at length was produced, but it was a secret, and the council didn't know about it at the time.

Later, an 18-year-old boy showed up at the council with the design and components of a proximity fuse. When we submitted it to the armed services, a member of the National Defense Research Committee took me aside and said in surprise: "It's like the one we're testing!"

The Inventors Council does not pass on inventions; it simply examines them to determine whether they may be of practical

use to one or another of the armed services, then forwards them to the service indicated. Many of our most important problems in national defense have nothing to do with abstruse science, but with everyday problems—such as keeping fighting men warm, well-fed and healthy.

Some time ago, a private in the Army wrote us a letter complaining that the bottom of any Army garbage can bulged up in a convex surface, whereas the Army's garbage-can scraper was straight-edged.

"Why not," he groaned, since he was a perpetual K.P., "produce a scraper with an in-curved edge?" We submitted the idea to the Army with a smile. The Quartermaster Corps thought it was wonderful, and immediately adopted it.

I think almost everybody could invent if he knew what we needed.

Arthur Maroth, former chief engineer of Carnegie Hall, New York City, invented a clamp-on pouring spout for paint cans after his wife accidentally slopped enamel all over the floor. Household complaints and accidents have inspired many inventions—dishwashers, automatic clothes dryers and electric mixers. One inventor of my acquaintance is now perfecting a device to keep automatic garbage disposers from chewing up silverware. He began the project the night his wife dropped a butter knife into her disposer.

With the cries of a baby still ringing in his ears, Walter Hunt, 100 years ago, bent a piece of wire into the world's first safety pin, thus taking the sting out of life for millions of infants. All of us are potential inventors—if only we were sensitive to the problems which surround us.

Through inspirational books, most of us have been taught that great inventors have been extraordinary men of extraordinary character and ability. As a matter of fact, they were ordinary folk with extraordinary patience, capacity for work and imagination. Many of them were also extraordinarily irascible and discontented, and comfort-loving.

Maroth once said to one of his machinists, "When you get mad enough at something to kick it or swear at it, you are very close to invention."

Not long afterward, a vacuum-cleaner salesman was demonstrating his cleaner in the machinist's home. The cleaner sucked up one corner of a throw rug and wouldn't let go. Trying to kick the rug loose, the salesman knocked over a telephone stand.

AN INVENTOR

Then he began to swear. Remembering Maroth's remark about rage and invention, the machinist awoke next morning with the answer: A thumb-operated valve in the handle of the cleaner. Whenever the suction head clung to a rug, a curtain or a cuff link, opening the valve would release it. Elementary? Most inventions are.

When Capt. Eddie Rickenbacker was cast adrift in the Pacific after a plane crash, he tried in vain to attract the attention of a rescue plane. Recently a California garage mechanic brought us a small signal mirror he had devised for his Boy Scouts. It would have solved Captain Rickenbacker's problem and has already saved the lives of many persons cast adrift. It enables the operator to aim a reflected beam of light directly upon a target many miles away, even into the eyes of an airplane pilot or the watch on the bridge of a ship. The inventor simply used a principle taught in every ninth-grade general-science class—"The angle of incidence is equal to the angle of reflection." One scientist in our council examined the model with dismay. "Why on earth didn't we think of that?" he said. "It's so simple."

Inventors Not All Scientists

Not by any means does an inventor need advanced scientific education. Hedy Lamarr, the actress, invented a guided torpedo. The concert pianist, Josef Hofmann, invented for the automobile and piano industries; Leopold Godowsky, Jr., a violinist (son of the famous pianist), was co-inventor of Kodachrome. He used to test formulas in his bathtub.

Our council has compiled a list of more than 380 technical problems affecting defense which require solution by inventors. Many of them could not even be understood by the average layman. But, by and large, technology is no barrier to most invention. There are principles which have not yet been discovered and the world is full of eager and curious young Newtons on whose heads apples are yet to fall.

There are a lot of things around the house and around the world, which, when put together, may prove to be a third or fourth thing, useful and entirely new. Recently, a young instructor at the Massachusetts Institute of Technology "married" a knife to a ring to make a finger scalpel for heart surgeons. The man who thought of the electric larynx, which enables people with damaged vocal cords to speak,

hit upon his idea while shaving his throat with an electric razor. He observed that the sound of the razor was altered slightly as he silently formed words with his lips. This phenomenon, no doubt, had been observed by countless men, but the inventor thought of those who could not speak.

Ideas for inventions may spring from the most unlikely places. Rudolf Diesel, the great German inventor, got his idea for the first compression ignition engine from a pocket lighter. Vivien Kellems, the Connecticut manufacturer, solved our problem of lifting slippery artillery shells with a steel version of a toy Japanese finger trap. Originally, she had applied the trap to the ends of cables for pulling them through conduits. She first had observed the problem in her own home where she saw with what difficulty two electricians pulled new wires through an old wall. This trick of using something as a substitute for something else betokens the inventive mind.

It is unwise to fasten onto just one idea. Present yourself a problem, then boil over with solutions. There are many tricks in inventing, as there are in other fields. For example, a youngster once said to Dr. Willis Rodney Whitney, founder of General Electric research laboratory:

"If you could help me find a way to take the ink out of old newspapers, I could make a million. There is no known solvent for the ink now used."

"Change the ink," snapped Whitney. "If you can't solve a problem, change the problem."

Learn to take a problem apart before you start to work on it. When faced with any problem, you already know some of the answers. You have to concentrate on the parts of the question you can't answer. Presently, there is little opportunity to work on this sort of project in the typical college curriculum. Even engineering graduates sometimes seem baffled when called upon to do original work in industry or the government.

David L. Purdy, who is in charge of training engineers during their first year with General Electric, told us the biggest failing of his new employees—the graduating crop.

"He Must Tell Us"

"They don't know how to tackle an inventor's problem," Purdy said. "If you tell a man to make certain routine calculations,

(Continued to page 238)



British Twin-Jet Plane Can Deliver Nuclear Weapons

Makers of the Blackburn NA 39, Britain's newest military plane, say it has a three-year lead over all other countries. Capa-

ble of delivering nuclear weapons, the bomber is powered by two De Havilland Gyro Junior jet engines. Its speed is secret.

"Bicycle" Chemical Sprayer Speeds Weed-Killer Tests

University of California scientists have devised a gasoline-powered weed sprayer that enables them to do a month's testing of herbicides in a few days. The sprayer, mounted between two bicycle wheels, automatically changes concentrations of chemicals applied to test plots. This method reduces the time required to determine the correct dosage. Previously, the scientists had to mix separate batches of weed killers and apply them to separate weed plots.

Walk-Along Spray Unit Covers Two-Foot Swath

Liquid fertilizer, as well as weed and bug killers, can be applied to 1000 square feet of lawn in three minutes with a walk-along sprayer. The sprayer covers a 24-inch-wide swath in a steady stream from a one-gallon container, or from a two or three-gallon tank sprayer. An adjustable chain lock holds the chemical container on the wheeled unit. A built-in stand permits upright storage of the single-wheel sprayer when it is not in use.





Clown cavorts atop a return-flue Avery, built in 1913 and popular with the crowd because of color scheme

Sparks fly, black smoke plumes from the ancient steamers, the aroma of fried chicken drifts to the threshers from the nearby church dining hall—it's Grandpa's Day at the

1958
FESTIVAL:
SEP 3-6, 1958

FESTIVAL OF THE IRON MEN

IF YOU DRIVE into the typical Midwest town of Mt. Pleasant, Iowa, during early September, you can't miss the overhead banner strung between two lampposts: "FREE—Midwest Old Threshers' Show—FREE." And if you are wise, you'll join the 40,000 other people who follow the arrows out to the smoky fairgrounds over a four-day period.

What you'll see not only will fascinate you, but somehow ease your nerves in these jangled days of H-bombs and sputniks.

The rise of the Mt. Pleasant show and similar old-time threshers' reunions is a paradox. In a time when the historic county fair is struggling to exist, threshers' reunions have taken over fairgrounds and farm lots from Yacolt, Wash., to Hampstead, Md., and are playing to turn-away crowds. The only possible explanation for their

By Clifford B. Hicks

PHOTOS BY A. M. WETTACH

SEE
JAN 59, 16

"Cavalcade of Power" includes models built precisely to scale. This little rig, including separator, can really thresh grain





Crowds gather as the steamers test their mighty muscles against braking mechanisms that check their horsepower. Old threshermen revive bitter arguments on the merits of each of the engines

Too tall to go under highway bridges, this engine had to have cab and smokestack removed before it could be trucked to the reunion. Rear wheels are three feet wide and seven feet high



No "hands off" signs here. Anyone can don cap, gloves and take over iron-man's seat

phenomenal success is that people love yesteryear. The stars of these shows are the huffing, asthmatic farm machines of Grandpa's generation, and in the cast are the old-time threshermen who operated them for real. The theme of the reunions is unabashed nostalgia.

Nobody can tell you for sure just how many reunions are held across the country, or how many hundreds of thousands of spectators watch in delight. Here at Mt. Pleasant, nobody even keeps track of the gate, which is wide open anyway. Last year somebody made a running check of the cars in the parking lot and discovered license plates from 45 of the states and four Canadian provinces. Planes fly into Mt. Pleasant's little airport from all over the country during the four-day reunion. And like most other reunions, this one is getting bigger every year.

If you're city bred, like as not you've never heard of threshers' reunions, despite their popularity. Before visiting the Mt. Pleasant show, take a brief look at the roots of such reunions.

Those roots go back to the 1880s, when somebody had the bright idea that a railroad locomotive could be run into an oat field without benefit of rails. All the locomotive needed was broad, cast-iron wheels. Once in the field, it became a stationary power plant to thresh grain. The idea worked, and the steam-engine business was born.



Star of the last reunion was this 1886 Case. Note seat near stack so engine could be pulled by team on road

Those early steamers touched off an agricultural revolution. The big machines were operated by engineers, who soon earned the tag "iron men" and became the greater-than-life heroes of farm lads for miles around. As soon as the steam engine proved itself, farmers and their hands banded together into "threshing rings" to follow the ponderous engine as it chuffed from farm to farm. The iron man was awake soon after midnight to heave coal, hardwood or corncocks into his beloved giant so steam pressure would be up, come dawn, and the envied water boy slept in the shakers of the separator. Hundreds of thousands of men, at one time or another, worked with the steamers. Feeding the threshing gang was the farm wife's biggest chore of the year, and we still say a growing boy "eats like a thresher."

But the old steamer had a relatively short life before it chugged out to pasture behind the barn. Suddenly, in the '20s, came the modern farm tractor with its gasoline engine. Within a span of four or five years the owner of a steamer, once the ruler of the farm roost, found his business melting away to the vanishing point. Each fall, hundreds of the old engines drew a final gasp through their iron lungs. In the '30s you could spot many of these derelicts rusting away behind barns all across the country.

Now comes the hobbyist, the steamer fan. He has a quirk in his mind, and he's the first to admit it. Admit? He can't help talking about it. He's fascinated by the

old steamers, just as others are enthralled by trains and fire engines. Only he's more so, for the steam-engine "buff" will invest thousands of dollars in just one machine. When he finds an old derelict he buys it, repairs it with handmade parts, shines up the brass bell and whistle, and stokes up the ancient contraption to chug again. Occasionally he pays a farmer more for a rusting hulk than the farmer paid for the same machine, brand new, 40 years ago. Steam-engine fans don't make sense, and are proud of it.

By now, all the obvious machines have been restored. Occasionally, though, someone still makes a lucky find. Not long ago

Ancient rig is fired up for a real threshing demonstration. Most of the old steamers are in perfect operating condition





Added features of the reunion are antique cars. Drivers parade them around the track, occasionally staging impromptu races

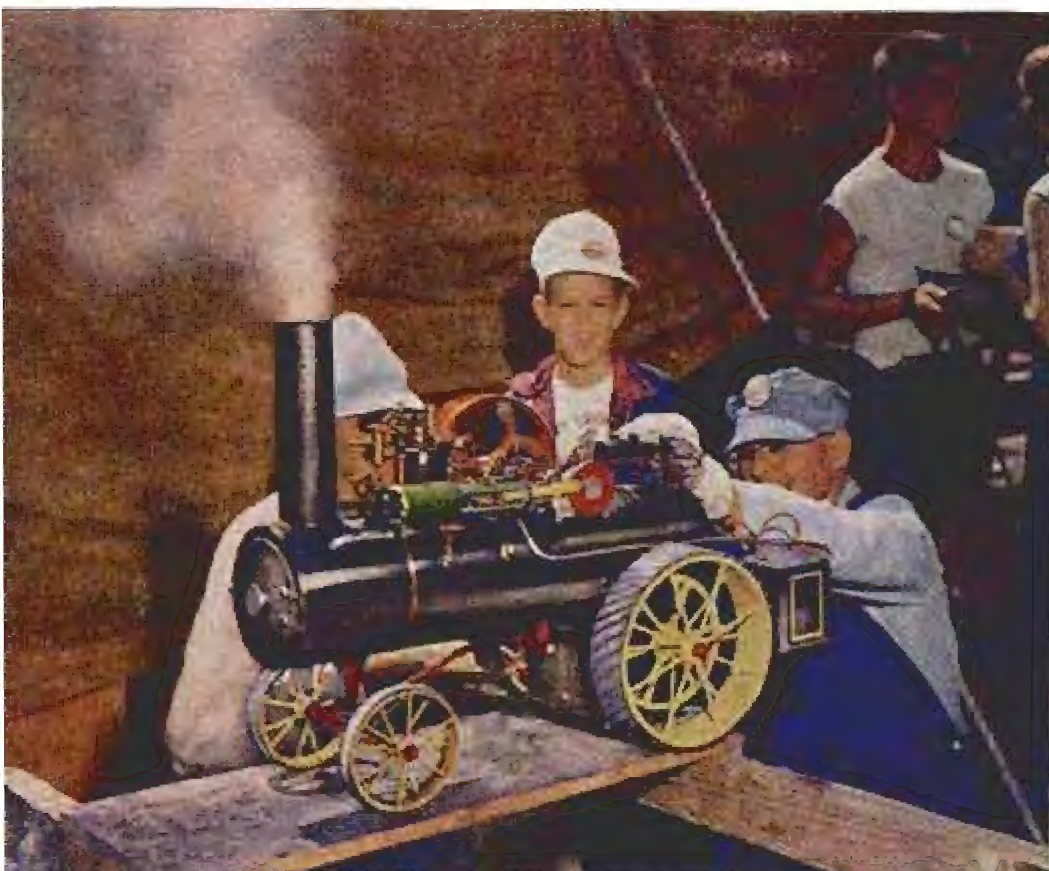
a buff on an air flight spotted an engine high on a mountain in Wyoming, where it once had powered a sawmill. At great expense he managed to move the 12-ton machine down the trackless mountain-side and restore it. Yep, a mighty lucky man. . .

Homemade Engines

Other buffs, unable to find long-forgotten engines, build their own from scratch and steam proudly through the reunions. Still others build operating scale models, precise right down to the dimensions of the whistle cord and throttle.

The chuff-chuff, toot-toot of a restored engine is an irresistible call to the soul of the old-time iron man or farm hand who once sweated beside such a behemoth. The ponderous hulk of iron is a magnet. Spot a restored steamer and you'll find a gang of old-time threshers threshing over the good old days. In recent years such informal gatherings have blossomed into the reunions. A reunion simply is a gathering of buffs with their restored engines, and the old-time threshermen. (An interesting sidelight is that both buffs and iron men nurse a venomous hatred for the internal-combustion engine. After all, it displaced their beloved steamers.)

This background, of course, doesn't explain the appeal of reunions to thousands of ordinary folk who never saw a steamer in operation before. Nobody tries to explain that appeal. It just is. Wherever steam engines go, their plumes of black smoke draw astonishing crowds. Ordinary folk stand transfixed as they watch a tug of war between two of the tremendous contraptions. They cheer wildly as a group of ancient and cumbersome, but uniquely attractive



Model steam engines really run, and are built precisely to scale, right down to the whistle cord



Surprising thing about the reunions is that everyone is fascinated, from family patriarchs to toddlers

steamers chugs ponderously up a 45-degree slope in a hill-climbing race. Confirmed hobbyists and threshermen drift by the hundreds from reunion to reunion, but the great bulk of spectators are folks who take a look in curiosity and remain to become fans themselves.

You can get the smoky flavor of the best of these reunions at Mt. Pleasant. A pall of black smoke covers the fairgrounds. After parking the car, you head for the gate with hundreds of others. Just ahead is a farm family grouped around the patriarch of the clan, a man in his late 70s. Overalls faded, a bright red bandanna around his neck, he stands there straight as a stalk of August corn.

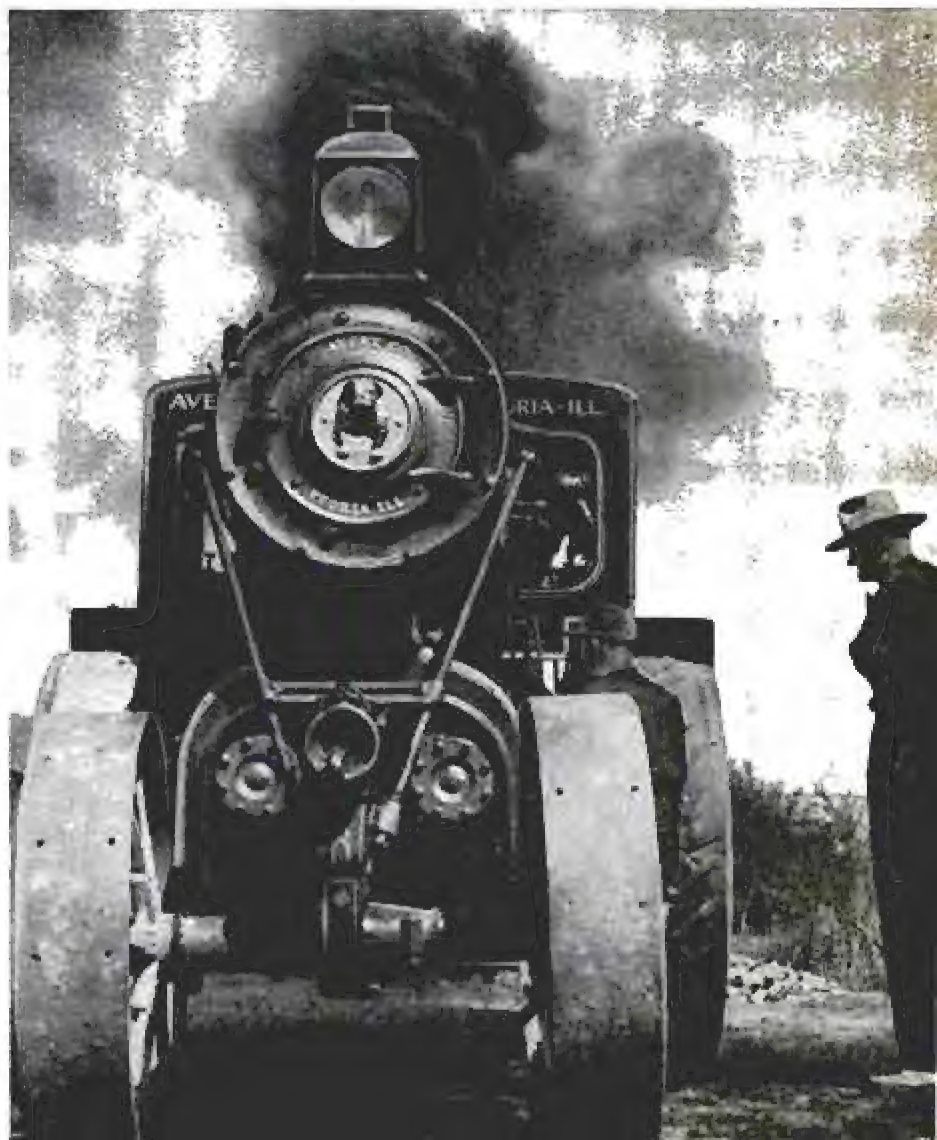
"Now you folks git to lookin'," he orders. "Don't miss that under-mounted Avery. I got to find out whether I'm goin' to drive the Reeves Double Simple in the parade today."

You, too, make a mental note not to miss the undermounted Avery.

Popping Steam

Just ahead is a long row of old-time steamers, each puffing a plume of smoke. Here and there steam pops off in a white cloud. Never, in the days of their glory, did these engines look so good. And they are dazzlingly colorful.

Old-timer meets old-timer: An aging iron man gazes nostalgically at a steamer similar to one he once drove. This engine is an undermounted Avery, complete with headlight. Reunions give former engineers a chance to relive the days of their youth





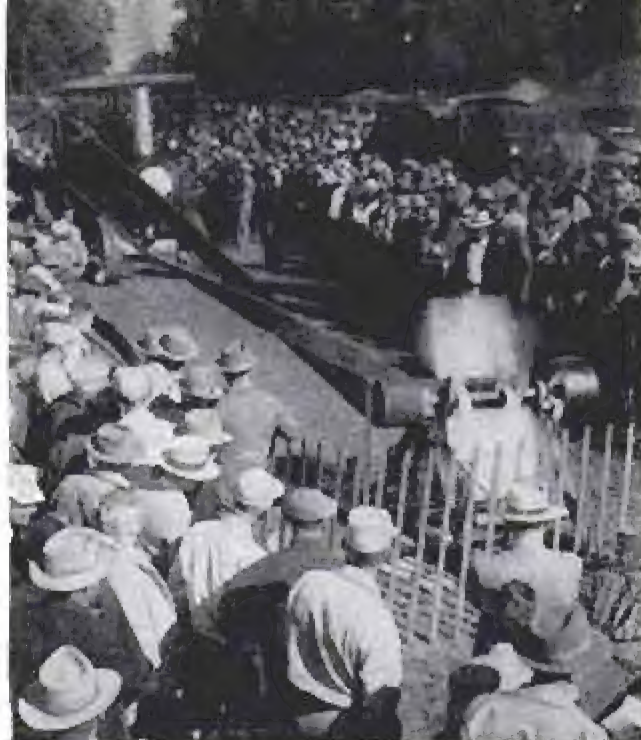
Old shingle mill is belted to a steamer. Then, sawdust flying, it turns out souvenir shingles for the crowd

Coat after rubbed-down coat of paint has been applied, black for the main working parts, shining crimsons, yellows, oranges and blues for the trim. Emblems, some still in existence and some long forgotten, stand out proudly — tigers and elephants, bulldogs and eagles. Brass bells and whistles gleam. Permeating the air even through the smoke is the sharp odor of steam cylinder oil. Every few seconds a whistle screams as an old iron man reaches up a gaitered sleeve to pop off some of the steam that's been building up in his boiler.

Monster Bucks Wildly

Over in the center of the grounds, a 10-ton monster is bucking wildly as it tests its power against the Baker fan, a machine once used to "run in" steamers at the factory. A belt 125 feet long runs from the steamer's flywheel to the huge four-bladed fan. Air pressure retards the blades; the

Weirdest contraption on display is gas tractor driven from an ordinary buggy. Old vehicle is steered by pulling on the reins



Baker fan, once used to break in engines at factory, now tests the power of each of the old-time monsters

faster the fan spins, the greater the horsepower of the engine.

Here and there other engines are going through their paces. One saws wood. Another cuts shingles. A third runs an old-fashioned threshing machine. Nowhere is there a "hands off" sign, and anyone can climb to the engineer's seat of any of the steamers. You can still read the original lettering on one of the monsters: "Rumley Oil-Pull Tractor. Guaranteed to burn successfully all grades of kerosene."

In one corner of the grounds, a fife and drum corps, most of the men in their 70s, tries to compete with the woeful whistle of the steamers. Over there, graying men tune their instruments for the Old Fiddlers' contest. Just behind them, the annual horseshoe-pitching contest is under way, and not far distant a youngster and an old man lean over a board to determine the checkers champ of the year. Spotted

across the grounds are many of the old farm implements — flails and ground-hog threshers, chaff pilers and hand-fed threshers, self-feeders and shingle mills. In one barnlike building are fascinating displays of antique furniture, pioneer relics, spinning wheels, frontier weapons and collections of old dolls and mechanical banks.

Everyone Stops to Visit

Nobody is in a hurry (except the wide-eyed kids) so everyone stops to visit with the old threshermen. As you wander along you overhear snatches of down-to-earth conversation: "He got all het

(Continued to page 218)



Trimming a 375-foot hedge by hand required six hours, but rotary-mower rig does the job in five minutes

Mower Becomes Hedge Trimmer

GIVING A "BUTCH" haircut trim to the top of his 375-foot-long boxwood hedge was quite a chore for Leonard W. Bender of Arcadia, Calif., until he found a novel solution to the problem. Bender built an inverted L-shaped wooden frame to fit over the hedge, which is two feet high and 21 inches wide. Next he removed the wheels from a light rotary lawn mower and placed the lawn mower on the frame. A counterbalance was needed so Bender added a platform to hold an anvil or a sack of sand. The rig is mounted on wheels so he can push it slowly as the mower trims the hedge. The mower also pulverizes the cuttings, so he doesn't have to rake afterwards.

Bender removes wheels from his power mower before putting it on the hedge-trimming rig, an L-shaped wooden frame on wheels





Jet Helicopter Powered by Gas Turbine

Operating without transmission and clutch, the Kaman K-17 jet helicopter is powered by a gas turbine driving a compressor located in the fuselage. Air from the compressor is ducted through a rotating seal to the rotor hub and out to jet nozzles at the tips of the rotor blades. The rotor is driven by the air expelled from the nozzles.

East Germans Build First Medium-Range Passenger Jet

East Germany has joined the nations of the world that produce medium-range passenger jets. Its first product was unveiled for public showing in Dresden. Details of the sweptwing craft's performance have not yet been released.



Next Month

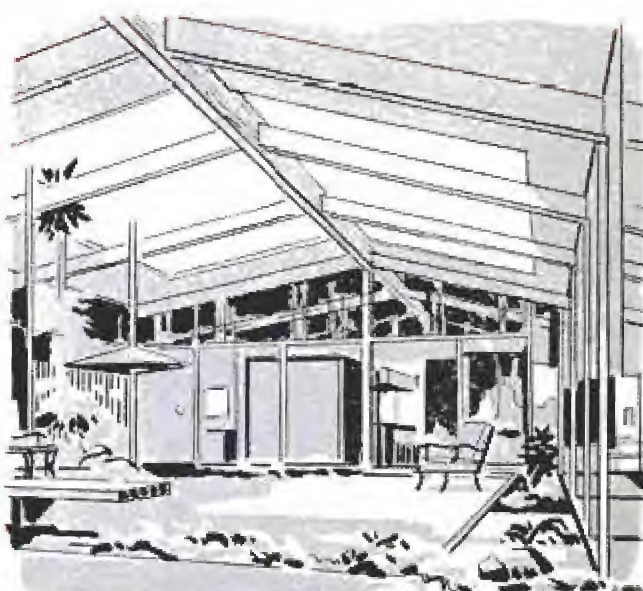
ANNUAL HOME SECTION

50 Pages

California, Here We Come!

With California-style houses sweeping the country . . . glass walls . . . open plan . . . patios galore . . . *Popular Mechanics* asked two noted West Coast architects, A. Quincy Jones and Frederick E. Emmons, to design the

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- Parade of Homes
- Scores of Stimulating Ideas for Home Planners

Annual Home Section-October-50 Pages



Trailer Holds Tent and Kitchen

The streamlined trailer at the right opens into the mobile kitchen and sleeping quarters above. Housed in the tent, which has weathertight fastenings and net screening, is a full-size double bed measuring 54 by 72 inches. The kitchen includes a two-burner stove, ice box, table, cupboards and a 10-gallon water tank

Scamper Sales, 644 Arwick, Inglewood, Calif.

TRAILERS for Work and Play



Motorcycle Carries Shelter in Sidecar

Owners of motorcycles who like to take long trips don't have to worry about living accommodations. They can carry their sleeping quarters right along with them—fitted neatly in a hinged panel on the motorcycle's sidecar. The panel expands outward and upward, forming the floor and wall base of a man-size shelter. The upper wall and roof sections are raised with tubular supports. Inside the shelter there is ample room for a folding table and two or three chairs. When it's time to go to bed, the table and chairs are replaced by two air-filled mattresses

Surrey Sidecars Ltd., Station Works, Approach Rd., Coulsdon, England

Unit for Sports Cars

Made of glass fiber, a lightweight trailer designed especially for small cars has a load capacity of 250 pounds. It can accommodate several pieces of luggage or many items of camping equipment—two sleeping bags, a stove, light, food box, cooking utensils, etc. The trailer is only 36 inches high, 42 inches long and 34 inches wide. In unloading his luggage or equipment, the vacationer doesn't need to carry anything very far. He merely detaches the trailer from the car and wheels it to the tent or cottage

Adler Engineering Co., 1344 Seabright, Long Beach, Calif.





Trailer Converts to Boat Size

When breakfast is over and the dishes are washed, the trailer at the right is lowered to a height of 47 inches for highway travel. In its closed position, above, the trailer is easy to tow: Air resistance is cut by more than 60 percent, cross-wind sway is reduced and the driver can see the road through his rear-view mirror. Measuring 17 feet, 6 inches in length, the trailer can sleep six persons with its couch-bed units and a large double bed. It has a stove with oven, running water and icebox. Its interior is six feet, four inches high

Odyssey Trailer Co., 3121 S. Oak Ave., Santa Ana, Calif.



Rack Can Be Stored on Bumper

Here's a trailer with two special features: Versatility and easy storage. Just right for hauling the equipment of the rancher and camper, this trailer also comes in handy on moving day. Or, if you want to transport a racing car or bring home some long pieces of lumber, the four sides of the trailer can be removed. When you've unpacked the load, the trailer can be quickly folded up into a compact unit on the rear bumper. The trailer has a 750-pound capacity and tubular-steel construction. Its box, made of plywood, measures 40 by 50 inches. Included is a high-speed wheel and a horizontal spring

Accessories International, 1931 Blake Ave., Los Angeles 39, Calif.





Six-Ounce Voice Box Aids Human Speech

Human-voice tones can be reproduced with a transistorized oscillator that weighs only six ounces. The user puts a small tube into his mouth and forms words with his tongue and lips. The battery-powered oscillator can be adjusted to reproduce tones from 90 to 120 cycles, the male fundamental voice range. A model for women has a tone range one octave higher. Tone and volume are individually controlled by the user.



Three-Wheeled Power Mower Can Cut Close to Trees

You can almost shave the bark off a tree with a three-wheeled power mower. With two swivel wheels and front and side trim, the mower can turn in a circle with a radius the width of the mower. The machine's ability to cut closely comes mainly from its cutting blade extending beyond the housing between the two swivel wheels. The mower has five cutting heights and a 2½-horsepower, four-cycle engine.

Fiber Mat Gives Grass Seed a Good Start and Retards Weed Growth



Bare spots on the lawn can be patched easily with a green mat of synthetic fibers in which grass seeds are embedded. The mat is applied to soil which has been prepared in the usual manner for seeding. The fibers prevent soil erosion, keep the seeds from washing away, retard weed growth.



Hydro-Ski Enables Rubber Plane to Land and Take Off on Water

With a hydro-ski attached to the main landing gear, an inflatable rubber aircraft can operate on water as well as on mud and other slick or hard surfaces. The

hydro-ski is fabricated of a lightweight aluminum alloy and can be attached in minutes. Goodyear Aircraft is building 10 one-man units for the Army and Navy.

Car-Door Brackets Hold Long Lumber

Strong enough to hold 150 pounds, a pair of hook-shaped brackets converts the family sedan into a "truck" for hauling lumber and other long items. The brackets slip on and off easily. On cars with full doors, the bracket mounts entirely on the door. On hardtop models, the upper part attaches to the rain gutter on the roof. The brackets are made of aluminum tubing and can be used on panel trucks and station wagons.



BOSTON SEES THE STARS IN HI-FI

By Volta Torrey

THE FINEST MODELS of the sky were formerly made in Germany. Now the old Zeiss optical plant, which built the projectors in most of the world's great planetariums, is serving the Russians. But a projector was completed in the United States this year that reproduces the sky's appearance with greater fidelity than ever was attained before, anywhere.

You could see this newest make-believe sky tonight, if you were lucky enough to be invited to sit in during a shake-down cruise—through past and future centuries—of this hi-fi projector in the Boston Museum of Science. On these runs, its builders are making final, delicate adjustments in the three-ton machine's many tiny optical systems. When these trial runs are completed, Boston's new million-dollar planetarium will be opened to the public, probably this month.

The difficulties of simulating the motions, the brightness and the twinkling of the stars has challenged the ingenuity of modelmakers for more than 2000 years. The first Zeiss projector, completed in 1924, only showed the sky as it appears from places north of the equator. Then the Zeiss company added a second spherical projector, so that the sky's appearance

from any point on the earth's surface could be shown. This improved model was so successful that about 25 such projectors were built. You can see the stars as projected by these famous Zeiss machines in planetariums in Chicago, Philadelphia, Los Angeles, New York, Pittsburgh and Chapel Hill, N. C.

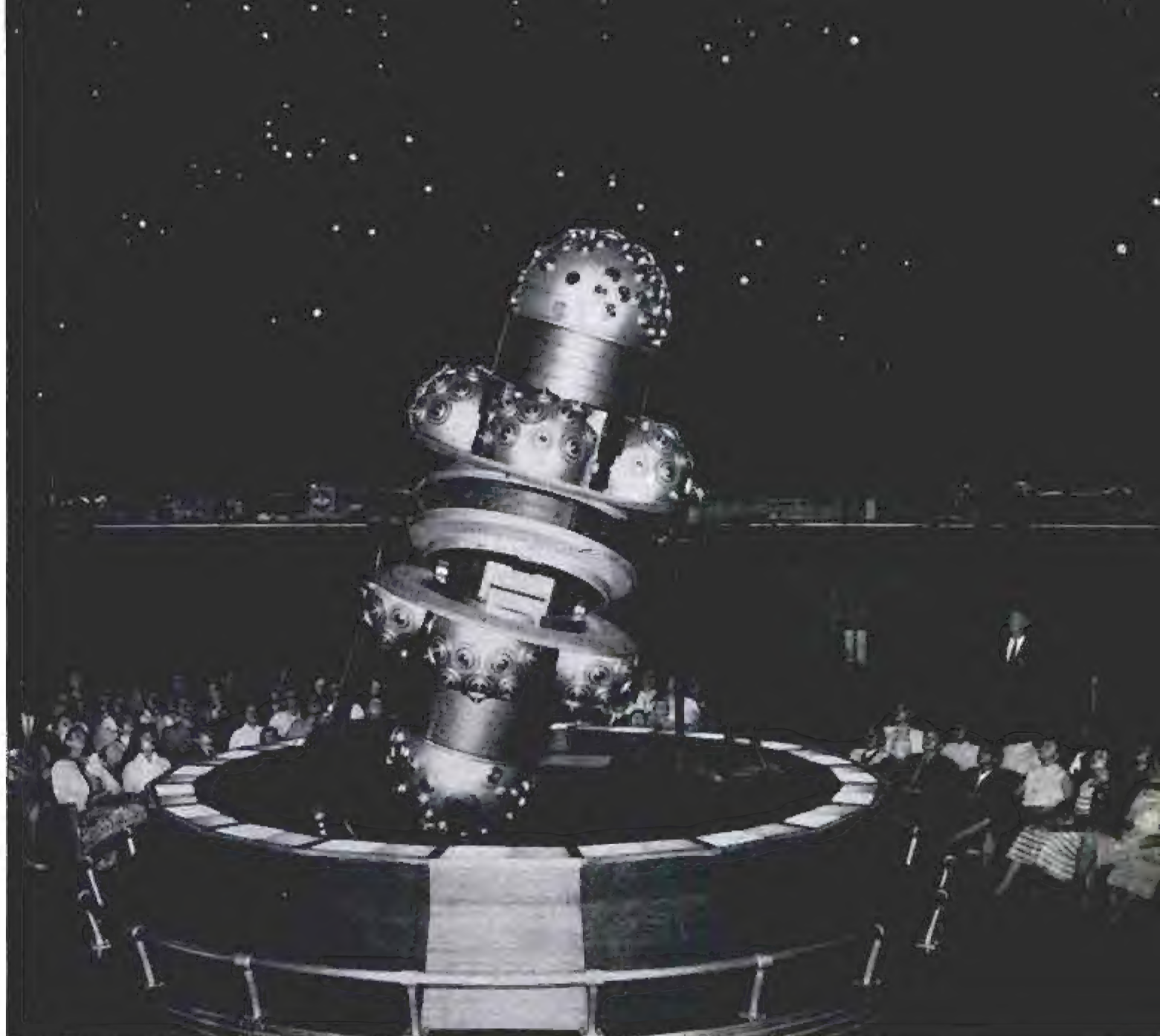
Most visitors to these star theaters are so awed by the magnificence of the spectacles they present that small differences between the imitation skies and the real sky are not noticed. But those differences will matter more in the future. Students preparing to track and chart the courses of spaceships will spot them. As more and more artificial satellites of the earth appear, and people we know begin venturing into space, more of us will be bothered by defects that heretofore worried only the astronomers.

A few years ago, San Francisco scholars and craftsmen got together to build a new type of projector for their city's planetarium. Theirs was the first effort in this country to improve on the work of the Germans. The Boston machine is the second American-made rival of the great Zeiss projectors.

John Patterson, the director of Boston's new planetarium, and Frank and John Korkosz of Springfield, Mass., studied the plans of all their predecessors before designing this mid-century model. Patterson is an energetic educator with a passion for precision; the Korkosz brothers previously had built a simpler star projector for their home town. All three had dreamed for years of building a hi-fi star projector. The division of Germany after World War II gave them their chance. Rather than go behind the Iron Curtain to purchase a Zeiss machine, the Boston museum's directors gave the three Yankee workmen the help they needed to show what they could do.

William Korkosz, son of co-builder of machine, views planetary assembly for Mars, Jupiter, Saturn and Uranus. The planets are projected from rings





Boston's new projector reproduces the sky's appearance with the greatest preciseness ever attained

The new Korkosz projector differs from the Zeiss company's masterpieces as greatly as a Diesel locomotive differs from the steam locomotives built decades ago. Instead of an open framework and dull black finish, it has a brightly colored anodized aluminum casing—which not only keeps out dust, and thus simplifies maintenance, but also makes it look like a model of a future space station.

As you enter the circular auditorium built to house it, you pass a huge Chesley Bonestell mural depicting a landscape on the moon. Then you find the projector, 13½ feet high, surrounded by seats for nearly 300 persons. It is brilliantly spotlighted like a new car in the center of a motorama. Behind the seats is a reproduction of the skyline outside. This includes the electric signs along the Charles River and the beacons on buildings in Bos-

ton's business district. But this whole circular model sinks out of sight, and other horizons appear, as the projector begins to illuminate the sky. Like the projector, the horizon and a dimensional sound system are controlled from a console at one side.

As your guide dims the light and starts the new projector racing through time, you discover what is meant by fidelity in a planetarium display. You see quickly that the differences in the magnitudes of the stars are more realistic. When the projector has received its final refinement, you will see that the motions of the planets are indicated more accurately and that Uranus is included among the planets for the first time in any planetarium.

This machine, you will discover if you move around, actually has more stars built into it than can be seen from any one seat in the auditorium. Some of the images are



Frank Korkosz shows some of the gearing that controls the stars in the projector. The Korkosz brothers spent more than six years building the machine



The cylinder in the rear projects a star field; the one in the foreground, a single bright star. The plate is the diapositive for a field of faint stars

so faint that they cannot be seen from across the room. And the brightest stars do not resemble little moons, as they do in many planetariums, but are twinkling pin points such as you see in the real sky. None strikes you in the eye, however, because all vanish as they pass the horizon.

Like the Zeiss machines, the Korkosz projector is really a pair of projection systems—one for the Northern Hemisphere and one for the Southern Hemisphere—on opposite ends of an arm that can be swung around. But whereas the Zeiss projector has a single spherical unit for each hemisphere's stars, this machine has a semi-sphere and four quarter-spheres for the stars of each hemisphere. This makes more variations in the illumination possible.

Stars of the first and second magnitude are projected from the semispheres; those of the third, fourth, fifth and sixth magnitude are projected from the quarter-spheres. For the bright stars, 1000-watt spotlight bulbs are used. For those of the third and fourth magnitude, 500-watt bulbs are used, and for the very faint stars, small bulbs provide the light. Hence, each star appears on the planetarium's dome more nearly the way it appears in the real sky.

There are 120 knobs on the two semi-spheres and eight quarter-spheres of the gigantic projector. Each of these knobs is the head of an individual optical-projection unit that covers an area about 20 feet in diameter on the dome of the auditorium. Eighty-eight of these projection units each cast the image of a single star. These are the very bright stars, and the projection unit for each one of them is exactly aligned with the filament of a bright bulb. These units are separately adjusted, so that the position of each of these 88 stars can be depicted with the utmost precision. No compromises are necessary.

These projection units for the bright stars have long-focal-length lenses, and the

widest image cast on the dome overhead is only half an inch in diameter. In other planetariums, some of the bright stars' images are as much as two inches in diameter. These stars also appear to twinkle. This effect has been achieved by permitting wire cages to revolve randomly around the sources of light. The wires intercept the light in approximately the same way that it is intercepted by our atmosphere when we watch the real stars.

If you were patient enough to count the stars on this planetarium's dome, you would find more than 9600. They come in 85 varieties. Most of them are quite faint, and are projected through slides representing star fields. The stars depicted in this way, and the 88 separately projected bright stars, are superimposed on the artificial sky.

To prepare the star fields for the hundreds of faint stars, tiny holes were pricked in tightly stretched aluminum plates. To make these holes, John Patterson had to make 85 needles of the required dimensions in his own workshop, because no such needles are ordinarily manufactured. The holes are accurate to within $\frac{1}{10,000}$ inch. Some of these 85 needles were used only once. The plate for the stars in one portion of the sky contains only 16 holes, but there are other plates for other parts of the sky that contain up to 500 holes of various sizes. An error in pricking these holes meant that a whole plate had to be redone.

Careful measurements with exposure meters were made to assure that each star field would have the proper brilliance. Then permanent photographic slides were made from the thin aluminum plates in which the holes had been pricked. Between each of these star plates and the source of light in the projector, there is an occulting mechanism. Gravity closes a shutter when the projector is tilted, in such a way that each star blinks out at the horizon.

The 120 knobs on the projector take care of the stars, but the sun, moon and the planets are handled differently. These are separately projected from rings that are placed between the semispheres and the quarter-spheres of the big machine. One pair of rings projects the images of the sun, the moon, Mercury and Venus; another pair provides for the images of Mars, Jupiter, Saturn and Uranus.

Originally, the three builders expected to complete the projector in two years. It has taken them more than six years. They have worked from a stack of blueprints big enough to serve for the building of a skyscraper.

Complete at Last

But last winter the final lens was fitted into the big projector in the Korkosz brothers' shop in Springfield, the machine was checked out, and partially disassembled for shipment to the Boston Museum of Science.

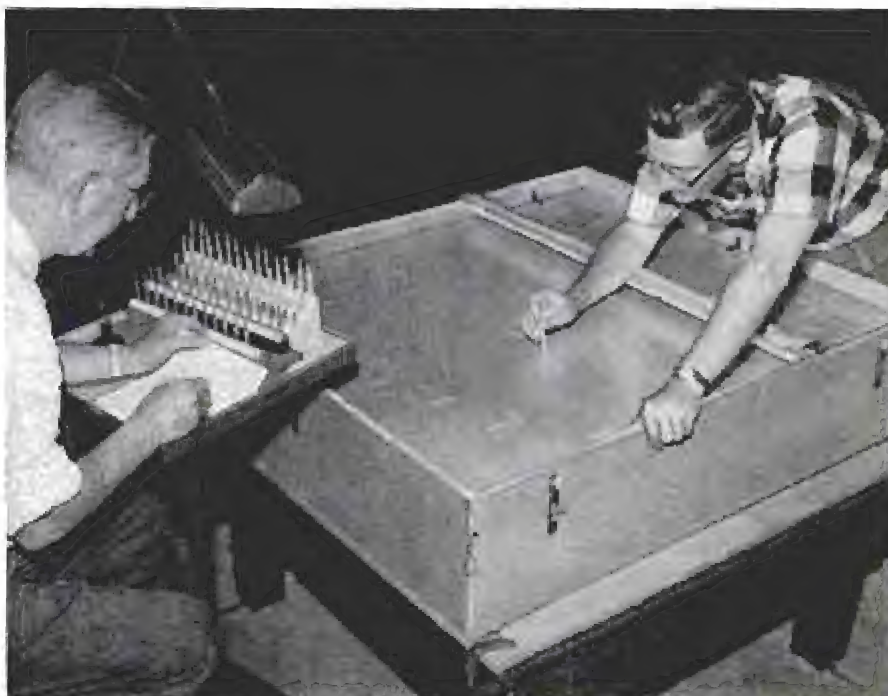
The standards the builders had set for themselves were high, and before the job was finished they had to provide for artificial moons. But this was no sweat. They had included 24 extra slip rings and spare circuits to handle satellites. They had also included extra transformers, so that the images of these satellites would correspond in brightness to the images of the real things. Adding Sputnik, Muttnik and Explorer was easy.

But now they wonder if they were far-sighted enough. Will two dozen extra slip rings and circuits suffice for future changes in the sky? What problems will the next generation of planetarium-projector builders have to solve? ★ ★ ★



The co-builders of the new projector, John, left, and Frank Korkosz, here adjust one of their machine's scores of separate optical systems

Diapositives used in star fields were photoengraved after thousands of faint stars had been indicated by holes punched in thin aluminum



APALACHICOLA

BIRTHPLACE OF MECHANICAL REFRIGERATION

2 MILES

By Ross E. Hutchins

THIS IS THE STORY of a man and an idea that were to change the way of life for a large proportion of the world's population. Not one person in thousands has ever heard the man's name. He was Dr. John Gorrie, and his idea was artificial refrigeration.

Turn back the calendar more than 100 years. The place is Apalachicola, a quiet fishing town on Florida's western Gulf Coast—a new, picturesque subtropical land beset by yellow fever and malaria. Here John Gorrie arrived in 1833. He had graduated from the College of Physicians and Surgeons in New York and had practiced medicine for six years at Abbeville, S. C. There he became interested in

Dr. John Gorrie discovered mechanical refrigeration when the machine he built to cool rooms "iced up"

malaria and, in 1833 accepted a commission as medical officer in charge of the U.S. Marine Hospital at Apalachicola.

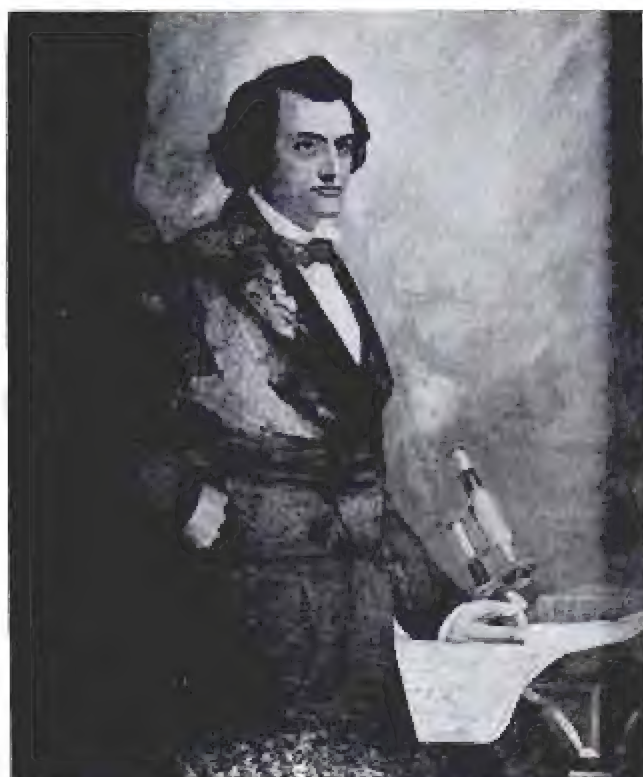
Within a year or two he was postmaster, member of the city council, treasurer of the city and territorial administrator, later a director in two banks and part owner of the Mason House, then the largest hostelry in the Territory of Florida. Just when he found time to practice medicine and to experiment with mechanical refrigeration is a mystery. The refrigeration experiments actually were a by-product of another scheme. In the treatment of fever Dr. Gorrie believed that if the patient's temperature could be artificially lowered, the disease would be cured.

With this in mind he attempted to air condition one room in his home by passing a current of air over blocks of ice. This helped, but Dr. Gorrie was not satisfied. Besides, the only ice available was shipped from New England by water and cost over a dollar a pound.

His mind turned to other possibilities. Could he obtain cold by chemical or mechanical means? About 1755 William Cullen had delivered a lecture in England on "cold produced by evaporating fluids, and of some other means of producing cold." John Vallance received the first English patent for the production of cold in 1824. These proposed methods depended on evaporation of fluids, but none of them was practical.

Dr. John Gorrie conducted most of his experiments secretly because it was a com-

Compression machine built by Dr. Gorrie was run by a steam engine; expansion of air absorbed the heat



mon belief that mere man should not tamper too much with what God had created. Only God had ever created ice; it was thought improper for man to attempt it.

The machine Gorrie eventually came up with depended on compression of air, which required energy, and then the expansion of this air, which absorbed energy or heat. The driving power for his cumbersome machine was a wood-burning steam engine; the original is now in the Smithsonian Institution at Washington, D.C., and there is a replica in the Apalachicola court house.

With this extremely unwieldy machine Dr. Gorrie satisfactorily cooled two rooms for his feverish patients. This was the birth of mechanical air conditioning.

The machine had been in successful operation several years when, about 1844, Dr. Gorrie had four patients critically ill. To alleviate their fevers the air-cooling machine operated at full speed over a long period when, one morning, it choked up and stopped. Investigation disclosed that the machine had iced up. Dr. Gorrie was quick to realize the import of the accident, and within a year or two he perfected a small machine that would produce ice in 8 by 10-inch blocks.

About this time the ladies of the local Trinity Episcopal Church decided to stage an ice-cream festival as a fund-raising project. Making the ice cream depended, of course, on an adequate supply of ice, scheduled to arrive by ship. Dawn of festival day arrived, and no sail appeared on the horizon. The festival appeared to be off and the ladies were broken-hearted. Then Dr. Gorrie showed up with a load of sardine cans containing ice. The chief difficulty confronting the astounded and delighted ladies was how to get the precious ice out of the cans!

From here on the story of Dr. John Gorrie follows the typical theme of the early inventor. There were attempts to raise financial backing for his icemaking machine, but they always petered out despite the fact that patents were issued. Most discouraging was the attitude of the public. One Northern editor wrote: "A crank . . . in Apalachicola, Fla., claims he can make ice as good as Almighty God!"

Due largely to his difficulty in marketing the icemaking machine Dr. Gorrie's finances went from bad to worse. On June 16, 1885, he died at Apalachicola, literally a victim of his cold-making machine that was to affect the lives of so many people.

Recognition came late. In 1914 his statue was placed in Statuary Hall at Washington, D.C., and in 1957 the state of Florida erected a memorial building at Apalachicola to house the mementoes of his life. ★ ★ ★



Radar System Checks Buses On Routes in London

Radar is being used by a London transportation company to report progress of its buses. Fixed scanning units at several check points send out pulsed-light beams that are reflected back by "cats' eyes" when a bus passes by. The cats' eyes are mounted on the side of each bus and give an identifying code number. Their reflected light is detected by a photo-sensitive transistor, converted into longer electric pulses and sent by telephone wire to the central control room where the signals are visually displayed on a route map.

Scientists Discover Heaviest Element Has Half Life of Three Seconds

Element 102—the world's heaviest element—has been discovered by a team of scientists at the University of California. The isotope of element 102 has an atomic weight of 254 and has a half life of only three seconds. At the same time, the team of scientists disputed the findings of other scientists who stated last year that they had discovered an isotope of 102 by using a different method. The California group said it had duplicated the former experiments without results.

☞Fluothane, a nonexplosive anesthetic, leaves no adverse side effects and allows patients to emerge rapidly.



Glacier-pilot Hermann Geiger brings in his ski plane for a snow landing high in Switzerland's Alps

FLYING HERO

On his missions of mercy, Geiger has often risked his life to save trapped and injured mountaineers



THERE IS NO MORE dangerous flying task in the world than trying to land in the towering, treacherous Swiss Alps. Yet this risky feat has become the almost-daily assignment of Hermann Geiger, a 42-year-old aviation instructor in Sion, Switzerland.

Geiger, of course, is no ordinary aviator. He's a pioneer glacier pilot whose mission is to rescue mountain climbers. Popularly known as the "Flying St. Bernard," Hermann Geiger has probably snatched more mountaineers from death than any other man alive.

Rescues 150 Climbers

Braving tricky mountain gales, sweeping air currents and narrow passes that threaten to smash his small plane against the cliffs at every moment, this hero of the Swiss Alps has rescued more than 150 trapped and injured mountain climbers and skiers, including 20 last year. Many Americans, Germans, Italians, Swiss and Austrians owe their lives to him.

One of the most expert airmen ever to sit in a pilot's seat, Geiger is a modest man who disclaims any special merit or bravery in performing his many outstanding deeds. When flying, he shies away from uniforms and usually wears a tweed suit.



Geiger will land soon and fly these victims of a plane crash in the Swiss Alps to a hospital in Sion

OF THE ALPS

Bringing a plane down in the "impossible" Alpine terrain was always considered folly. But Geiger, an enthusiastic flier since he was 20, was convinced it could be done.

He devoted himself to the problem of glacier-landing after witnessing the fall of four mountain climbers without being able to help them. He immediately alerted the nearest rescue station, but by the time the rescuers reached the spot of the accident, all four victims were dead. Geiger became obsessed with the idea that he could have saved four lives if he had been able to land.

Develops Special Ski

His first move was to develop a special retractable ski that he fitted to his Piper Cub. With this landing gear, operated by a hydraulic lift he designed, the plane was able to take off on wheels but come down on skis.

On his first trial, in May 1952, he made four successive landings on the 9240-foot Kanderfirn Glacier. Since then, he has brought his fragile plane down on tiny snow and ice strips high in the Alps more than 15,000 times. Many of the fields have been less than 200-feet long and 100-feet wide. The highest landing was made on the

Landing near the summit of Mt. Titlis (10,000 ft.), Geiger rescues a stranded mountain-climbing party





Searching for victims in the Alps is a difficult task, and sweeping air currents make it a perilous one

14,421-foot Monte Rosa glacier, an unofficial high-altitude landing record.

Geiger's principal job is to transport supplies by air to isolated mountain huts, snowbound villages or power projects high in the Alps. Often he defies death to deliver a baby carriage to the wife of a cabin keeper, or carry food and fodder to settlements cut off from the outside world during the winter.

Supply Runs Start Rescues

It is on many of these supply missions that a rescue operation is initiated. In 1954, he saved eight avalanche victims. Once he spotted a mountain guide holding onto a rope from which two climbers were dangling over a deep ravine. He immediately landed on a nearby glacier and helped the guide to haul the two men to safety.

Most mercy missions are launched by an emergency phone call to Sion Airport, which Geiger operates. Alerted, Geiger takes out the extra seat of his Piper Cub to make room for a stretcher. Usually, the victims find themselves comfortably resting in a Sion hospital bed within two hours after they were first spotted. ★ ★ ★

For landings on snow and ice, Geiger designed a retractable ski that is operated by a hydraulic lift





Mighty Totem Pole Begins Voyage to London

Measuring 100 feet long and weighing 30,000 pounds, a huge totem pole recently was hoisted aboard ship in Canada for its trip to London. The gift from British

Columbia to Queen Elizabeth was carved from a cedar tree 600 years old. Prior to the voyage it was towed 400 miles from Queen Charlotte Isle, where it was carved.

Water-Fog Curtain Prevents Spread of Fire During Plane Fueling

Each of five airplane fueling positions at Boeing's plant in Renton, Wash., is protected by its own water-fog curtain. In case of fire, the curtains are turned on to pre-

vent the spread of fire and heat to other planes. Each curtain is 155 feet long and consists of 32 alternate wide and narrow-angle spray nozzles.





Extension Cables Replace Tow Rope for Emergency Starting

Carrying a set of booster cables in the trunk of your car may help you avoid a few of the headaches of getting the engine started when your battery is low. With the cables you can "borrow" power from the

battery of another car and have your engine running in seconds. One of the eight-foot cables is used to connect the positive terminals of the two batteries. The other is connected to the negative terminals.



Engine Changes Atom Heat Into Electricity

Atomic heat is converted directly into electricity in a new engine invented by two professors at the Massachusetts Institute of Technology. Called a thermoelectron engine, the instrument has no moving parts. It consists of two metal plates inside a vacuum tube. One of the plates is heated to about 2200 degrees F. and the other, spaced only $\frac{1}{1000}$ inch away, to 1000 degrees. Electrons "boil off" the hotter plate onto the cooler one. When the plates are connected by wire outside the tube, electrons are conducted off to perform work. Heat can be provided by ordinary fuels, nuclear fuels or solar energy. One potential use of the thermoelectron engine is in satellites or missiles where weight is a primary consideration. Because the engine operates silently, it might also be used to power military vehicles.

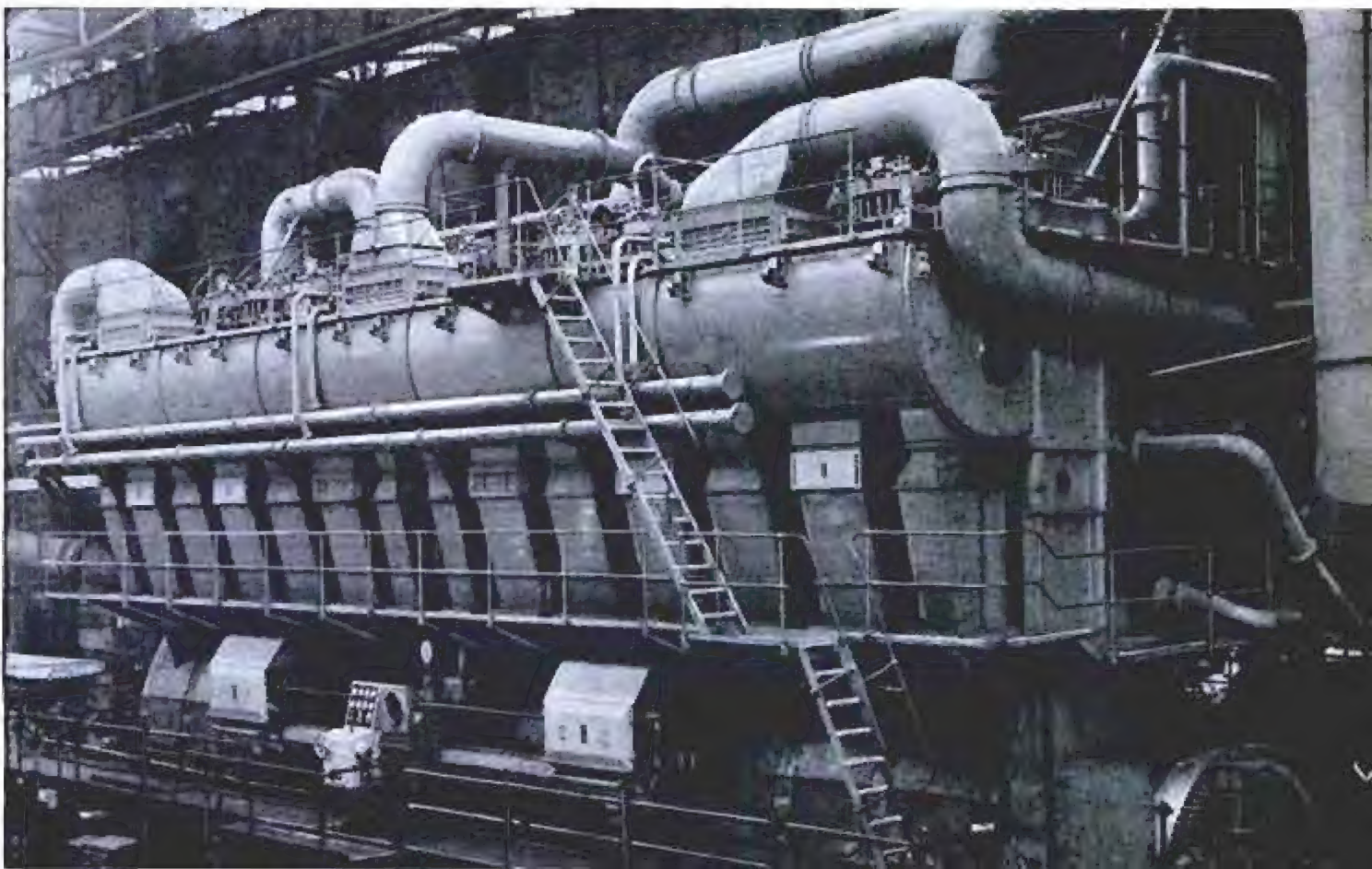


Portable Range Gives Golfer Practice at Home

Rain can keep a man off the golf course, but it can't stop him from practicing shots at home, outdoors or in the garage or basement. A collapsible golf range can be set quickly. It includes a tee-off mat and an apron pocket that snares balls on the rebound.

Big Italian Tanker Run by 14,400-Hp. Motor

Italy's biggest tanker, the *Sicilmotor*, is equipped with a 14,400-horsepower Diesel-Fiat motor. Each of the motor's 12 cylinders is 750 millimeters in diameter. The tanker weighs 31,100 tons. A larger motor under construction at the Fiat works has 20,000 horsepower.





Student racers in Purdue "Grand Prix" round a difficult turn; all wore helmets and cars had roll bars

"GRAND PRIX" OF THE LAWN-MOWER RACERS

By Bill Brooks

(Photos by Dick Vellinger)

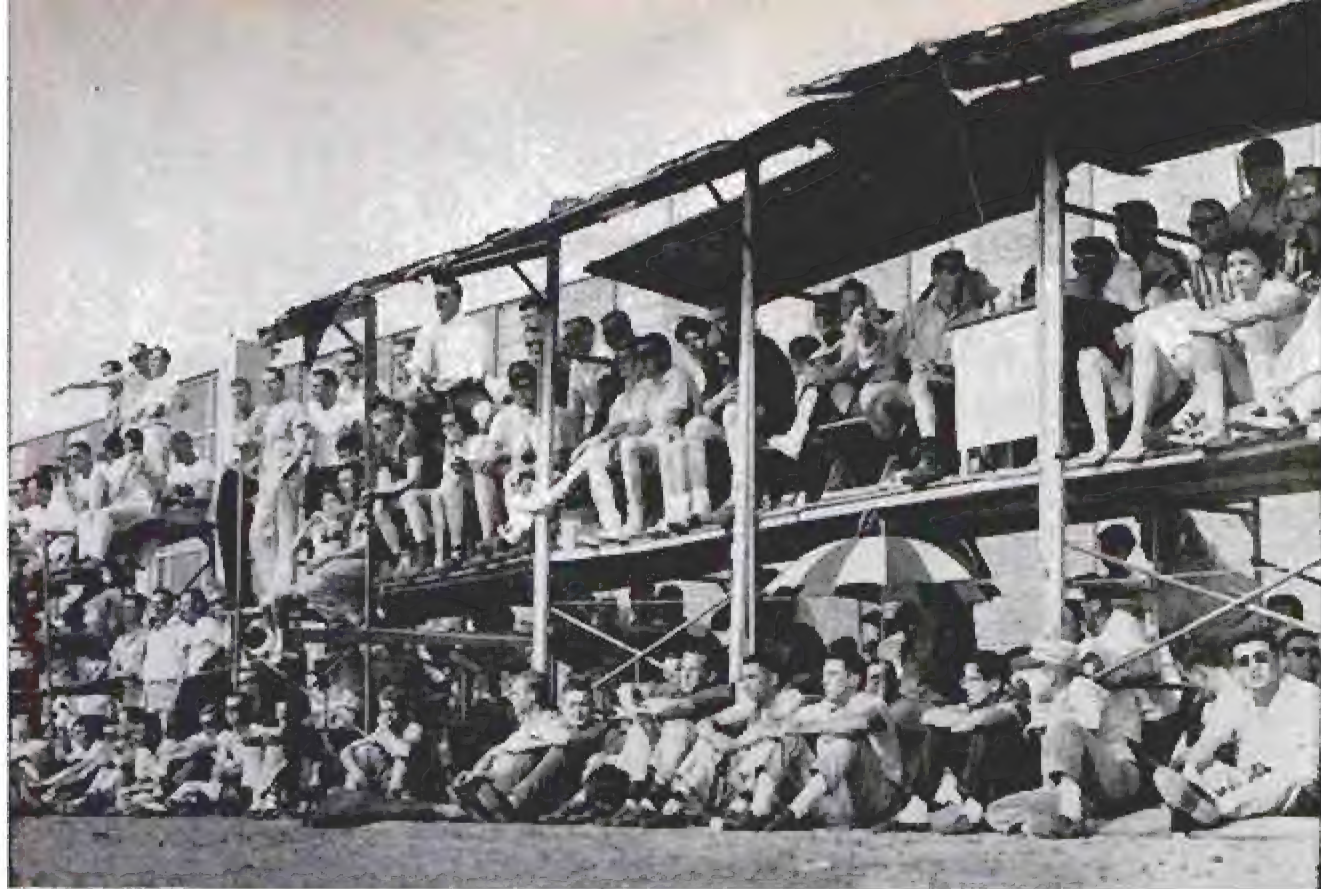
A TRADITION was born at Purdue University on Saturday, May 17, 1958, amid a roar of lawn-mower engines.

Twenty student-made race cars spluttered, skidded and swirled around a special six-tenths-mile racecourse on parking lots and an adjoining street just north of Purdue's new co-recreational gymnasium. It was the Purdue Auto Club's first "Grand Prix" and for more than 2000 onlookers it was a real "ball."

The race began with a Le Mans start (where drivers run to leap into cars) at 3:50 p.m. and was called to a halt at 6:30. The winner's trophy went to the car that made the most laps.

Car No. 1 conked out before it could reach the "pits." Here a worried mechanic anxiously awaits the arrival of crewman with the proper wrench





Homemade bleachers on side of the race track held some of the 2000 onlookers attending the "Grand Prix"

The affair, hailed as a roaring success by drivers, mechanics and onlookers, was sponsored by the Purdue student auto club, headed by Roger T. Yule, of Pittsburgh. The original idea belonged to ex-club president Peter Helferich, of Evanston, Ill., who conceived the notion of combining Purdue engineering-school skills with college spirit and the pre-500-mile-race atmosphere. Indianapolis is about 60 miles from Lafayette, Ind., where Purdue is located.

"Runts" Made by Students

The "rumbling runts" were all made by students — representing fraternities, residence halls and individual groups (such as one grandly called Northwestern Racing Associates, whose initials, NRA, confused the middle-aged spectators in the crowd). All power units were basically the same— $1\frac{1}{2}$ -horsepower engines normally used on power mowers. Regular pump gas had to

be used and the bore and stroke of engines had to be left untouched. Any other "hopping up" was permissible.

Purdue engineering students reached hitherto unscaled peaks of ingenuity in boosting $1\frac{1}{2}$ horsepower to 3 and $3\frac{1}{2}$ horsepower by milling, shaving, grinding, incessant tests, and the introduction of larger carburetors and motorcycle transmissions. Many of the cars had three-speed transmissions and the drivers performed some mighty frantic shifting to keep the rickety ramblers at top speed.

Auto-club officials had arranged things efficiently: Hay bales and traffic cones to mark the course, fire marshals with extinguishers at regular intervals, judges and timers, and chaps with brooms to keep the track swept clean. On hand also, were policemen to keep the cheering spectators behind ropes, and an ambulance to tend the wounded (one gashed ankle and one

It was a clean, if slightly hectic start. Here the drivers had just leaped into their moving cars in best Le Mans style





Left, 10-minute welding job was done with portable outfit in the pit. Car has been turned upside down to expedite repairs. Above, Jack Floyd of SAE fraternity holds up a pit sign for his driver. Students used Speedway signals and many drivers got signs mixed up, adding to the fun

slightly burned hand, both suffered by pit-crew workers).

Cars Get Wild Names

Names on the cars were wild and typically collegiate, such as "Silky Sullivan Special," "Built in Disneyland by Mickey Mouse," "Fiji Fury" (with pit crew and drivers' shirts lettered likewise), and one machine of Spartan design labeled simply "SNAFU."

Drivers—there had to be a minimum of five per car—wore football helmets, Air Force-pilot helmets or Indianapolis Speedway-type crash helmets. Each driver usually raced 25 to 30 minutes, then was relieved.

Safety rules were strictly observed. If a car spun or jumped off the racecourse or even touched another car, the yellow or red flag was shown to slow or stop other entries. A car touching anything was immediately summoned to the pits for a checkup. One driver carelessly left his goggles up and was promptly flagged to the pit area for a sharp reprimand.

Worn-out tires were tossed away like stale doughnuts and fan belts littered the pit area like confetti. Bumpers bent, drive-shaft chains snapped, cotter pins sheared off and axles broke. There were five welding outfits in the pits. One axle-welding job consumed only 10 minutes and the car zoomed back into the fray.

One elated crewman shouted: "We did a 10-second fuel change!" He had trotted

alongside his car as it rolled in, engine dead, for a pit stop and had poured in a tankful of gasoline—one quart.

Indianapolis Speedway signals were used but there were titillating variations. The Sigma Alpha Epsilon crew held up a board with "X" on it. The driver sailed blithely by. They chalked "IN" on the board. The driver came in wondering what the "X" meant. No one seemed to know.

Another driver, passing his crew, held up one hand. "What's that signal?" asked a crewman of a mate. "Beats the heck out of me," was the reply. "Let's let him go." And they did.

One sweating driver did a complete lap with half an orange in his mouth. A pit-stopping driver grabbed a soft-drink bottle and had it to his lips before someone yelled: "That's gasoline!"

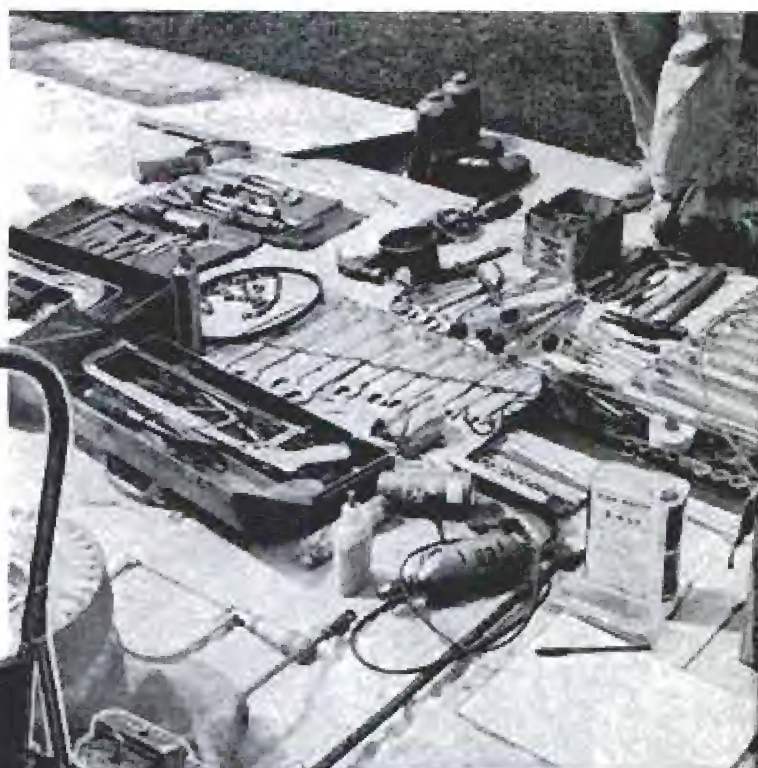
The Dover Co-op crew, whose car led the race for over an hour, suffered a heart-breaking setback when a tire blew and they discovered the only spare had been left at the residence hall. By the time a crew member ran for the tire and returned, three cars got ahead of Dover who finally finished fourth.

The winners were kissed by Grand Prix student queen Sonya Porter, of Kokomo, and appropriate trophies were presented.

The winning entry was Gables Courts with 133 laps in 2 hours and 40 minutes—80 miles at an average of 30 miles per hour.

"Not bad," said Yule. "Must be some kind of record for lawn mowers." ★ ★ ★

Below, driver John VanSickle of Columbus, Ohio, waits for a signal after a stop at the pit. All of the 1½-horsepower lawn-mower engines were "hopped up" to 3½ horses by Purdue's ingenious engineering-class students. Larger carburetors helped



Above, these are the tools rounded up by one pit crew to meet all emergencies. Some of them came in real handy

Jim Moneyhun of Indianapolis drove winning car. Grand Prix queen Sonya Porter stands by with Roger Yule





German Police Call Box

Residents of some German communities can call police headquarters directly through special telephone units built into cabinets on posts. Microphones in the units, located at outlying intersections, also can be used by police to monitor traffic noises.



Portable Gas Detector

Approximate concentrations of certain gases in the air can be determined quickly with a hand unit that pumps samples into a small tube of chemicals. The concentration figure is based on color changes in the tube and the number of pump strokes.



Monitor Listens in On 28 Frequencies

Air-crash investigators can now tell exactly what radio communications had been made between pilots, and between pilots and ground controllers before an accident. A magnetic tape-recording system has been developed that can simultaneously monitor around-the-clock radio communications on 28 frequencies. The voice monitor is built into five six-foot-high cabinets and has two recorders. Its magnetic tape, constantly in use, is $1\frac{3}{4}$ inches wide, is on reels 19 inches in diameter. One recorder is used at a time. When it is used, an automatic switching device starts the second recorder.



Northwest Orient Airlines photo

Plane-Reservations System Gives "Electronic" Answers

Airline reservations can be made in a fraction of a second with an automatic electronic reservations system. By pressing buttons, a reservations agent can also tell if a flight will be early, on time or late—and if late, why. The system consists basically of a random-access Univac file computer and a number of "agent sets" linked to the computer either directly or by communications trunk lines.



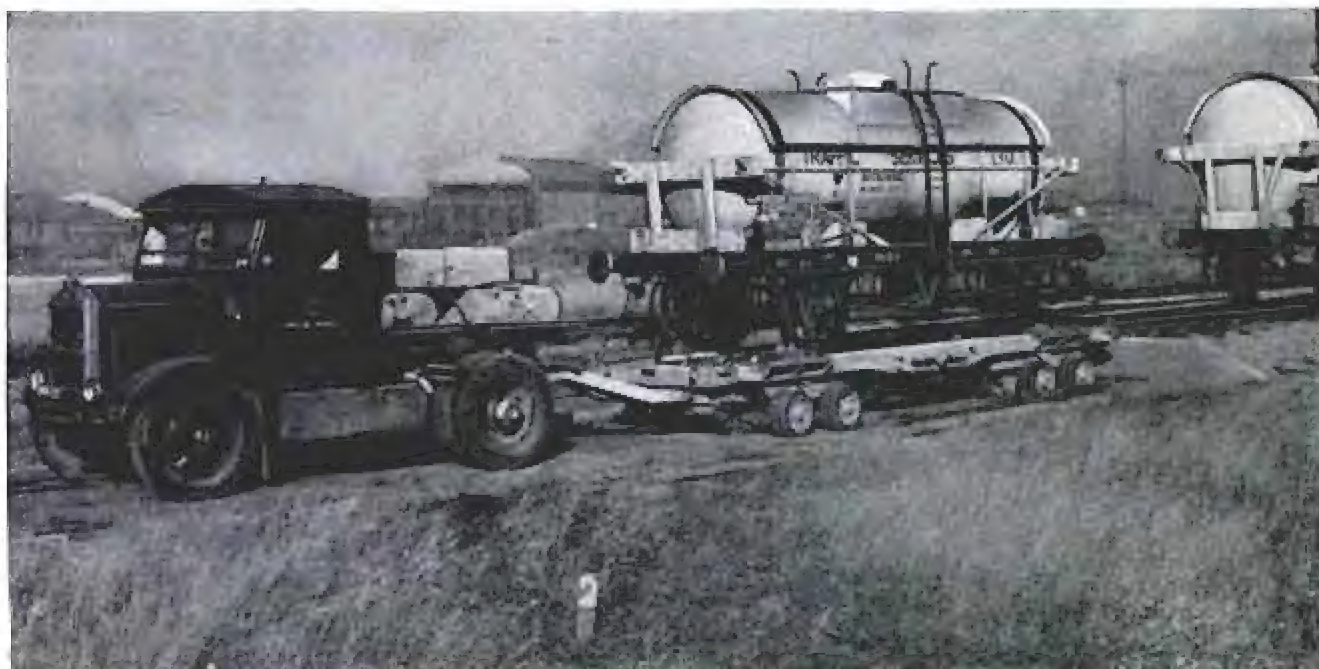
Vest Keeps Dry Cells Warm With Heat From Body

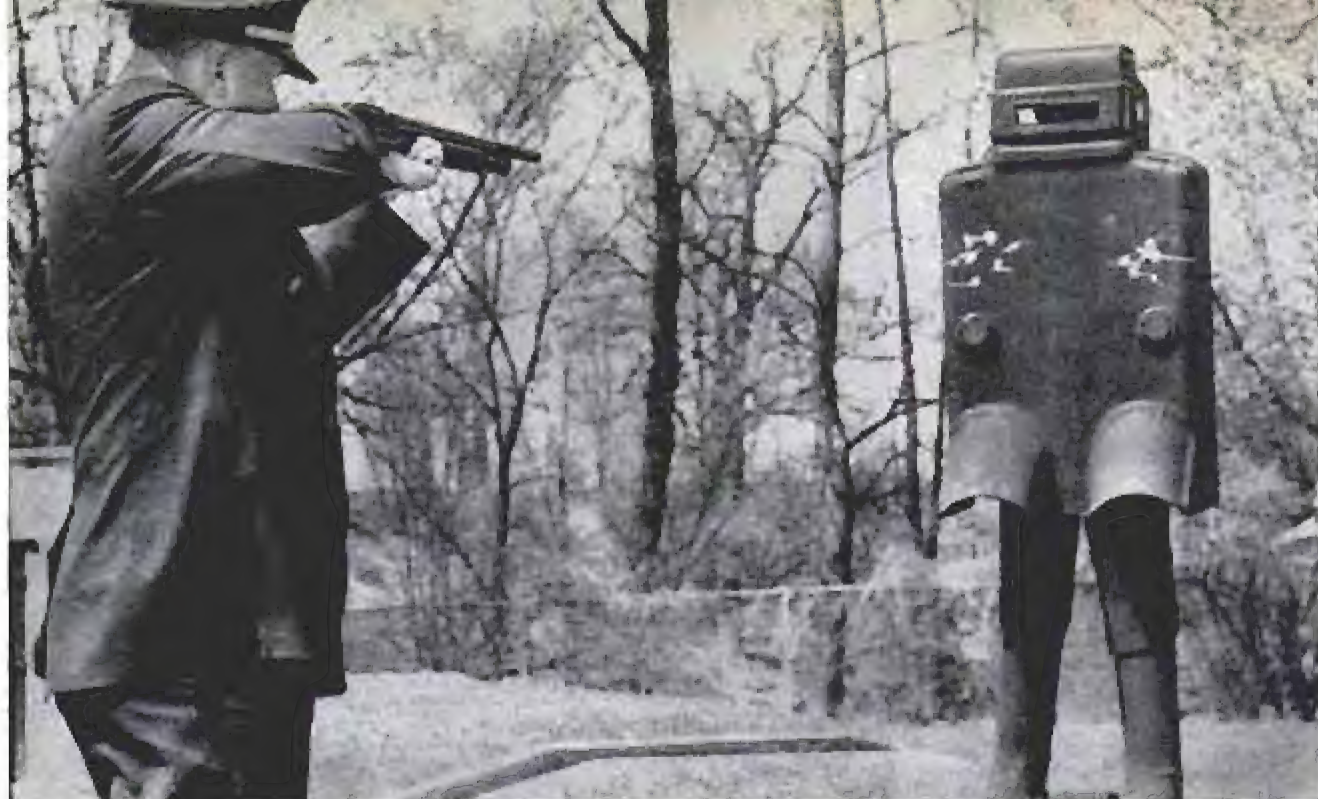
Using body heat to keep dry cells warm, a battery vest has been developed by the Army for radio operators on duty in extremely cold weather. Dry-cell batteries are placed in a vestlike garment worn beneath the parka. A cord is used to plug in radios. With the vest, batteries developed for low-temperature use are expected to stay in service 10 times longer in 40-degree-below-zero weather.

Trailer Truck Carries Tank Cars From Siding to Industrial Plant

In England, tank cars are taken from a railway siding to a nearby industrial plant by a low-level trailer truck. On the trailer's platform is a section of track just long enough to accommodate one car. Height of

the platform is two feet seven inches, coinciding with the level of the shunting spur at the transfer point. This method of filling tank cars provides direct-rail access to any building in the plant.





Armor of Plastic and Glass Fiber Protects Man From Bullets

When the shooting was over, inventor Harvey Freeman removed his bulletproof armor and said, "I hardly felt a thing." He

perfected the armor from an alloy of plastic and fiber glass. Freeman calls his invention an "armadillo."

Electromagnetic Detector Can Locate Underwater Subs

Submerged submarines can be detected by an electromagnetic device developed originally for the discovery of base metals. The device makes use of an electronic-tube principle. Called the Orbitron, it is fitted on an S-55 helicopter. Its only visible parts are long antennas that extend fore and aft

from the nose and tail. They are part of the fixed coaxial system that supplies electrical impulses needed to detect ore bodies of metals like zinc, lead and copper. These pulses are transmitted and received coaxially with the direction of the helicopter's flight.

Newborn Babies Are Television Stars on Hospital's Closed Circuit

Fathers in Hialeah, Fla., get their first look at their new offspring by closed-circuit television. A TV camera in the hospital

nursery is connected to a standard receiving set in the waiting room. Visitors switch the set to Channel 6 for the "baby show."



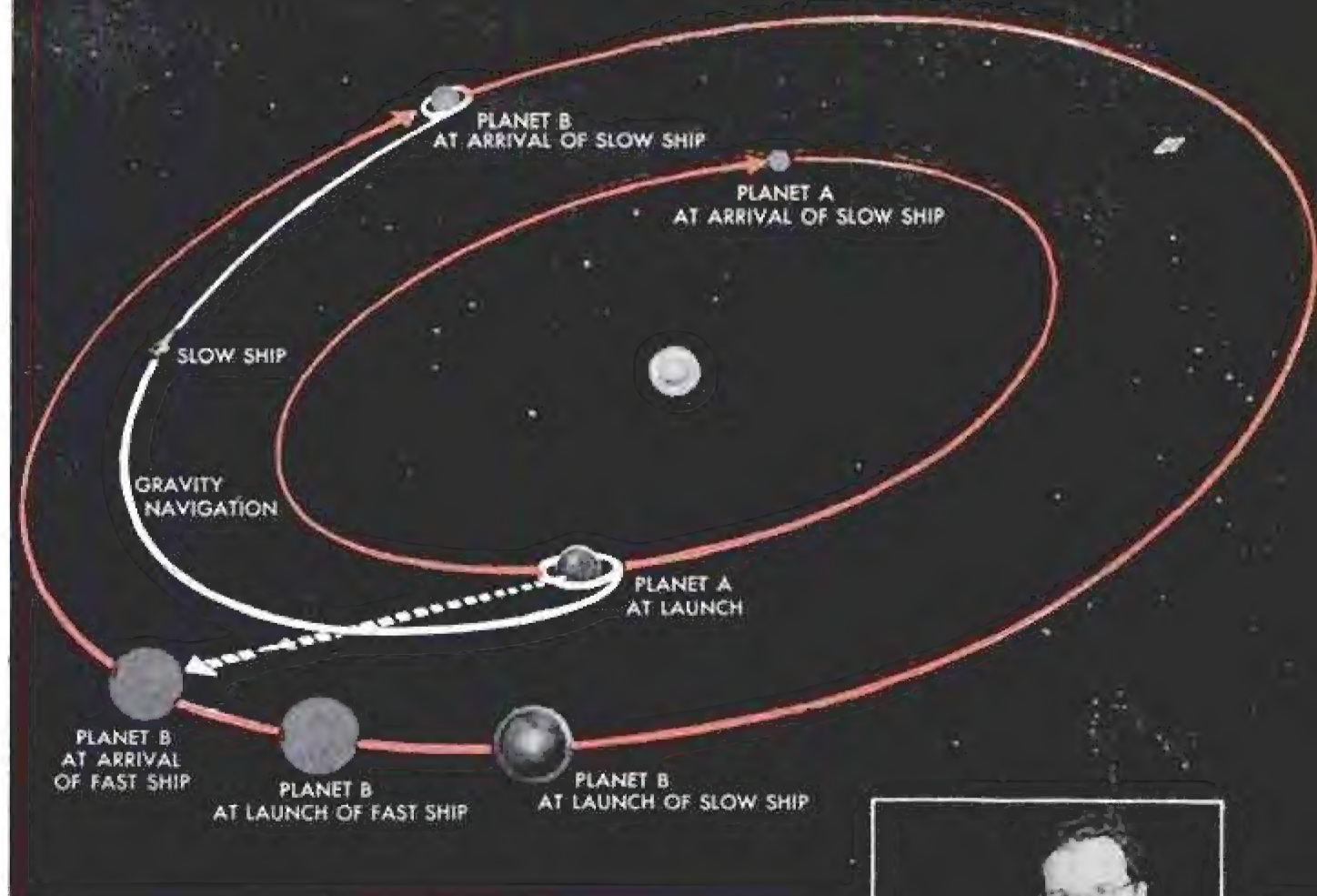


Fig. 1. Drawing shows difference between slow and fast-ship navigation

HOW WE'LL STEER IN SPACE

Reprinted "PM Highlights"

By Dr. Peter A. Castruccio

In his position as Advisory Engineer for Missile Guidance and Space Communications for Westinghouse, the author has probed deeply into questions of how ships can navigate through space



MAN WILL CONQUER SPACE. He will travel to the moon, and to other planets in our solar system.

But if he is to succeed in this most dramatic of all human undertakings, he must first solve two great problems. I believe we can reasonably expect solutions to both.

The first of these problems, of course, is to develop power plants powerful enough to push him out into the vastness of space and return him to earth. Travel in space itself requires relatively little power; most of the energy must be spent in overcoming gravitational pull of the earth, and of the moon or other bodies which man has the daring to explore. This initial push requires so much power that today's power

plants are barely equal to the task. Not much power is left available for actual space travel.

For this reason we must use to the utmost any natural forces which are available — and fortunately, powerful sources are available. We can take advantage of these forces in a method known as "gravity navigation."

Imagine, for a moment, that there is a spaceship traveling around the sun at the same speed as the earth travels around the sun. Two forces act on this ship: The pull of the sun and the centrifugal force of the ship's motion. These forces are exactly equal; the ship neither falls toward the sun nor escapes outward. Now imagine that we add a gentle push in the same direction the

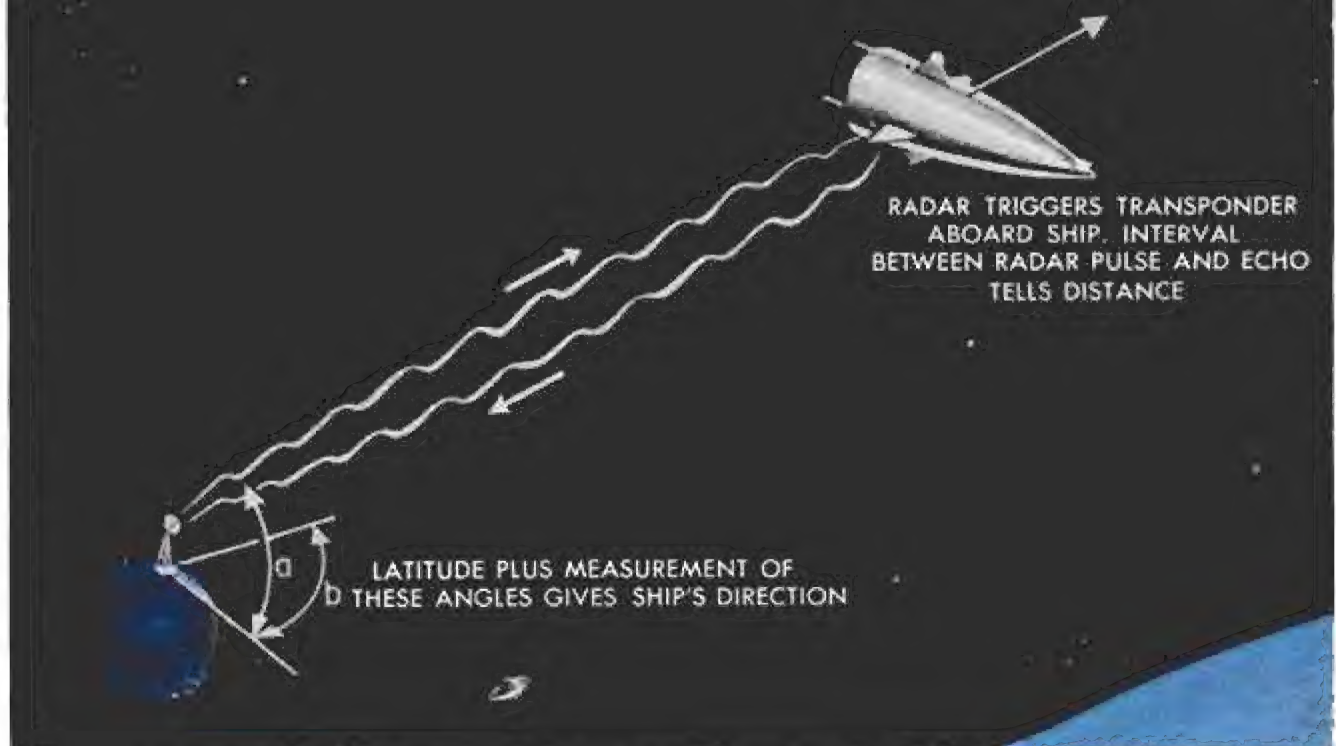
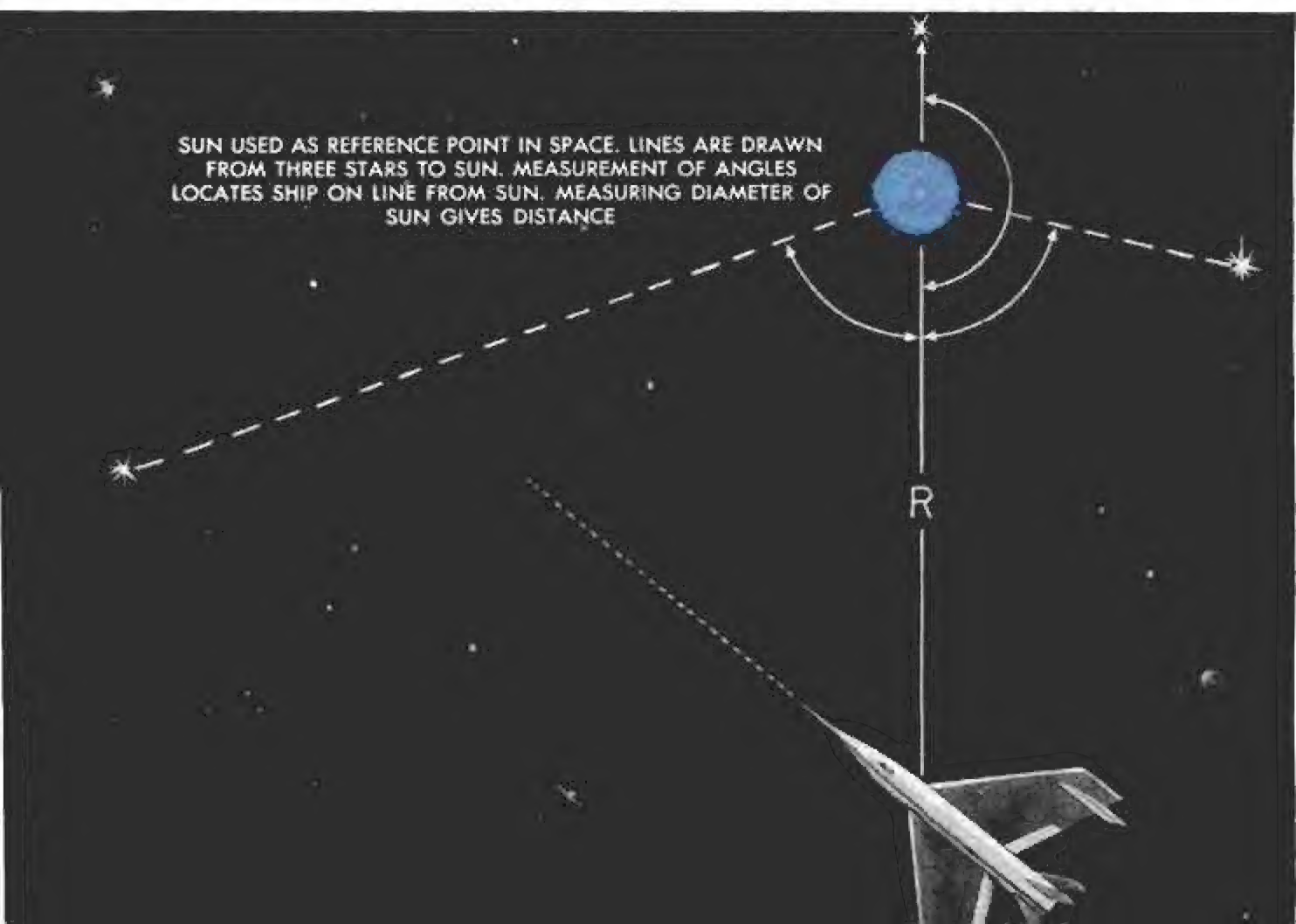


Fig. 2. Measurements of radar signals and their echoes will determine the course and range of the spaceship

ship is traveling. The ship speeds up, its centrifugal force increases, and exceeds the inward pull of the sun. This causes the orbit of the ship to become elongated. The ship now follows an ellipse or oval route through space. The secret of gravity navigation lies simply in making the furthest point of the ellipse coincide with the planet we wish to reach.

Without question we can and will use this system of gravity navigation in the near future. We'll make the trip in two steps. First, the ship will vanquish the pull of the earth by acquiring sufficient speed (some 18,000 miles per hour) to orbit around the earth. As an earth satellite, of course, it will be moving, with the same speed as the earth, around the sun. Next

Fig. 3. Position can be fixed from inside ship by measuring angles of three reference stars and the sun



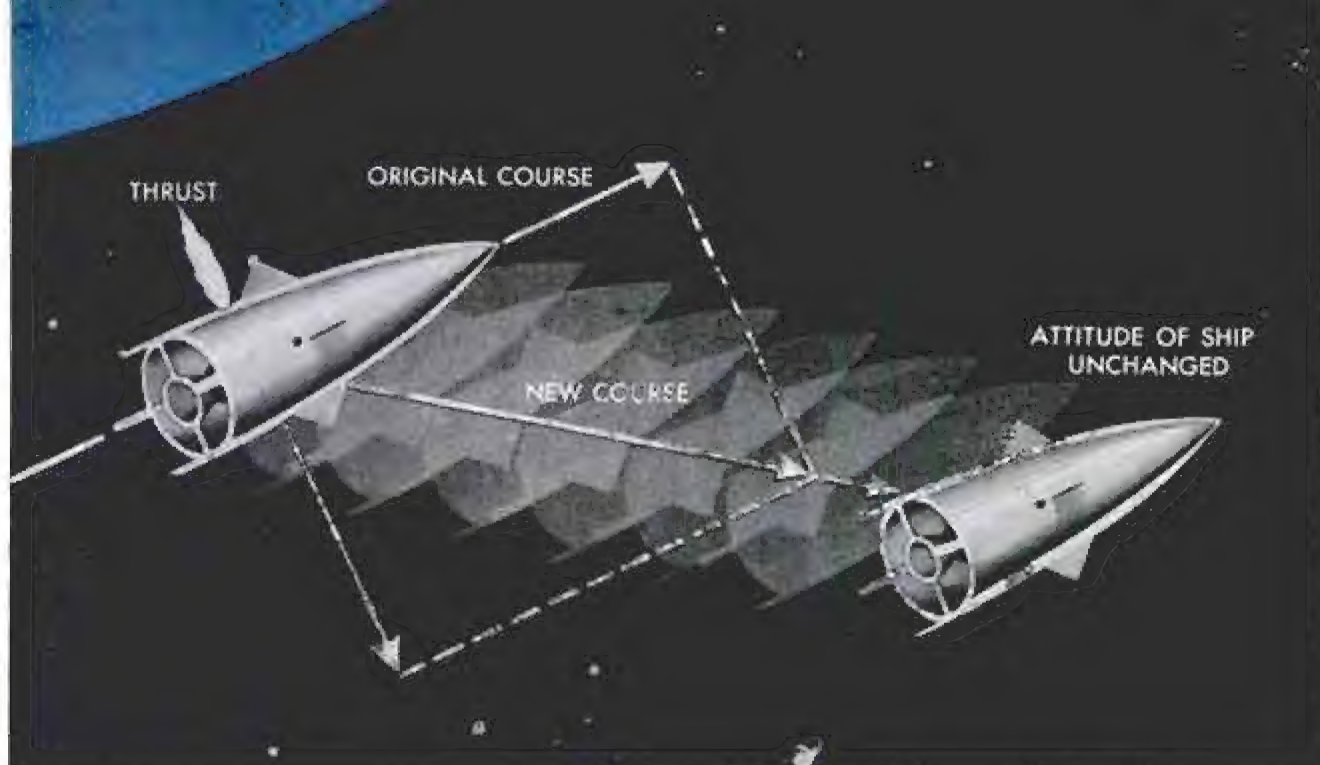


Fig. 4. Spaceship must use rockets to change not only course, as shown above, but also attitude of ship

we'll give it a relatively gentle push at precisely the right instant and in precisely the right direction to send it out on an elliptical orbit around the sun. If the push is exactly right, it will carry the ship to one of the planets, which also is orbiting around the sun. Thus we can use the speed of the earth as a "springboard to space."

Obviously this method is time consuming. The speed of travel is limited, and we must wait possibly months or years for the planets to assume their proper positions for such a voyage. We are in much the same situation as the ancient sailing master, who had to await favorable tides and whose speed was limited by the strength of the wind in the sails.

But as power plants become more power-

ful, space travel will gradually become faster. Eventually gravity navigation will yield to straight-line powered navigation, as shown in Figure 1.

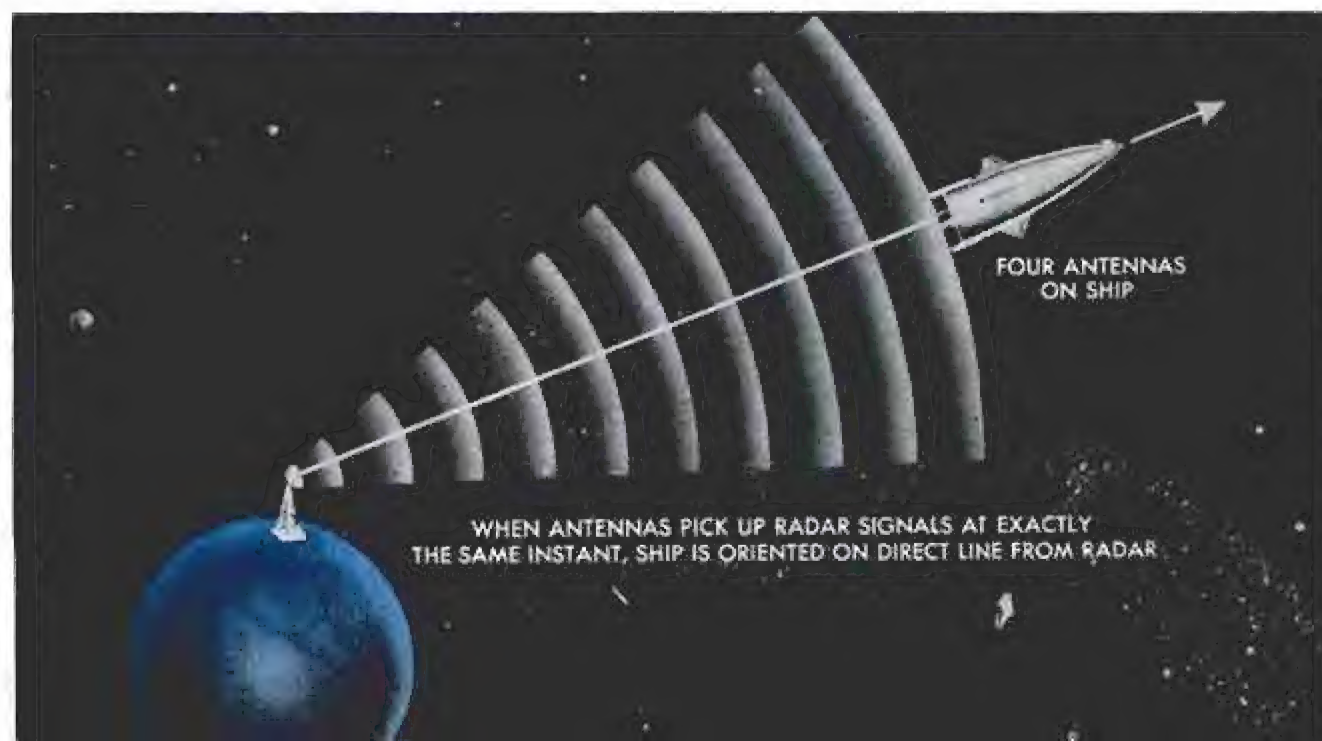
This is the sequence I see in the immediate future, initially with unmanned ships: Orbiting satellites, lunar crash-landings, round trips around the moon, landings on the moon's surface and finally interplanetary missions. Subsequently, but somewhat overlapping this evolution of unmanned space flight, will be travel by man himself in much the same sequence.

Extremely Accurate "Aim"

The second of the two great problems to be solved (the first was the development

(Continued to page 230)

Fig. 5. When four antennas on a ship pick up radar signal in phase, ship is in line with radar beam





Mystery: Six Passengers But Where's the Engine?

Six persons can ride in a personnel carrier Willys Motors is building for tests by the Army. Curb weight is 1500 pounds and it can carry another 1500 pounds. The seats

fold flush into the floor to form a flat-bed truck. Its four-cylinder, air-cooled aluminum engine is hidden beneath the floor and drives the car at 60 miles per hour.

British Architect Works Under Hemisphere of Glass

Designed by an architect for use as his studio, a dome-shaped structure at Kingston Hill, Surrey, England, is covered with 150 glass triangles. The glass is supported

by a wood frame. Panels can be installed behind the glass triangles where shade or privacy is wanted. The dome was erected in two days by the architect, Hugh Pope.



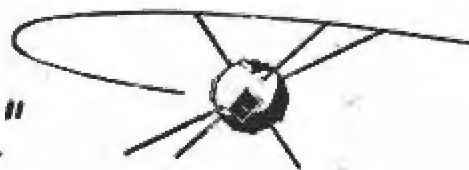


Sidewalk Superintendents Have Ringside Seats

Amateur engineers and architects in San Francisco get preferred treatment while watching the construction of a \$10,000,000 office building. The sidewalk superintendents are provided with bleachers that seat 100. Two large illustrated signs beside the bleachers show how the completed building will appear. Viewers are issued Sidewalk Superintendent Club membership cards and are notified when special phases of construction are scheduled to begin.



Diary of a Manmade "Moon"



There's something very astronomical about the U. S. Navy's Vanguard I satellite—and we do mean to pun. Not only is it our highest manmade astronomical "moon," but its travel diary produces astronomical figures.

Dr. John P. Hagen, Vanguard project director, predicts it will stay in orbit for 200 years. The original prediction was for 20 years' flight.

Currently it is circling the earth every 133 minutes at more than 18,000 miles per hour.

At that rate, in 200 years it will have traveled some 31,557,402,000 miles in its 790,912 trips around the world. This would be the equivalent of nearly 170 round trips between the earth and the sun.

Vanguard I travels over 39,900 miles in each orbit and makes the circuit over 10 times a day.

Earth's atmosphere exerts some drag on satellites up to about 400 miles altitude, but Vanguard I is virtually free of this drag because its lowest altitude (perigee) is 405.1 miles and its highest (apogee) is 2463 miles.



RADIANT HEAT SCREEN has an automatic thermostat that limits surface temperature of the panels to 150 degrees. The three-panel portable screen is 56 inches tall and about 5 feet wide. It operates on 120-volt house current and uses 1000 watts of power. The panels are finished in charcoal-colored plastic. Pilot light glows when heater is turned on

Arvin Industries, Inc., Columbus, Ind.



ELECTRIC BARBECUE uses no charcoal but has permanent ceramic material which glows when grill is connected to 110-volt outlet. The "coals" also sizzle when drippings fall on them from food being prepared on the grill. The amount of heat can be varied from mild warming for biscuits up to high broiling heat for steaks. A rotisserie can be added

Stanthony Corp., 5341 San Fernando Rd. West, Los Angeles 39, Calif.

LOUVERED DOOR, sometimes called a "New Orleans" door, is described by the manufacturer as an authentic replica of the type of inside door used in old Southern mansions. Made of sugar pine, the door is 1½ inches thick and 6 feet 8 inches high. It's made in two widths, 2 feet 6 inches and 2 feet 8 inches. The doors are trimmed and sanded to take nearly any finish

Louisiana Louvres, 1015 El Centro St., South Pasadena, Calif.

SOCKS DISPENSER, below, eliminates clutter of men's socks in dresser drawers. The rolled socks are placed in the dispenser from the top and are removed through a large opening at the bottom. The box holds seven pairs and you can tell what colors and fabrics are available through a slot in the front. The dispenser hangs on a wall or in the closet

Sox Box, El Reno, Okla.



WHAT'S NEW FOR Your Home

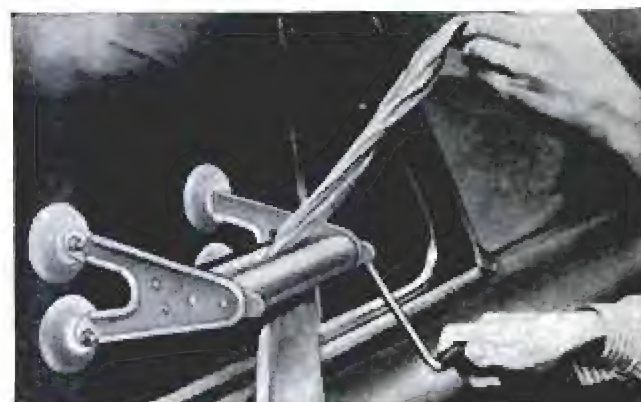
LOG TONGS enable the fire builder to carry the firewood with one hand, leaving the other hand free for opening doors and the firescreen. The device has three tongs with small conical points. A free-swinging tong is dropped over the wood, which may be round, flat or split. When lifted, the weight causes the tongs to grip the firewood securely.

John Martin & Sons, 2730 Country Club Blvd., Cleveland 16, Ohio



PORTABLE WRINGER has suction cups that attach it firmly to glass, tile, enameled or other smooth surfaces. The wet garments are pulled upward with one hand while the other hand is used to turn the handle. The unit has a rustproof metal frame and solid rubber rollers. The wringer can be taken on camping trips or mounted in the kitchen or garage.

R. Hermesen, Dept. PM, 3415 Knox Pl., Bronx 67, N.Y.



SHOE SCRAPER, below, does not have to be fastened to any surface although screws and holes are provided in case the owner wants to mount it in a permanent location. A series of four specially designed cleats allows quick removal of snow or dirt with a few strokes of the foot. The scraper is made of metal with a rubber backing which gives it a skidproof base.

Cashin Mfg. Co., 3213 W. Fifth Ave., Chicago 24



DOUBLE-MIRROR CABINET ends the need to hold a hand mirror while viewing the back of the head. The mirrors are attached to the inside surfaces of double doors on a new-model medicine cabinet. The front surfaces of the doors are covered with frameless mirrors which give the effect of one large mirror when the doors are closed. Doors have piano hinges.

Goslee Co., 1500 Brookpark Rd., Cleveland 9, Ohio





Complex Electron Microscope Built by Teen-Ager

Seventeen-year-old Glenn Kuswa of Wauwatosa, Wis., built an electron microscope in his basement workshop and can now produce an electron beam and a magnified image. A high school senior, Glenn spent about 1800 hours and \$250 on research, design, machining, assembly and testing. He held down costs by machining parts out of scrap metal from a junk yard, and developing his own electronic circuits from government surplus. The full-scale, 450-pound microscope has won first prize in several junior science competitions.

Navy and Air Force Weapons Look Alike but They Don't Act Alike

Though they have a marked similarity, the Navy's Chance Vought Regulus II and the Air Force's Lockheed F-104A Starfighter have different roles as defense weapons. The unmanned Navy weapon is a surface-to-surface missile. The other is an

interceptor, called "the missile with the man in it." Both missiles are powered by the General Electric J79 engine. The J79 is rated in the 15,000-pound thrust class and enables both to operate in the Mach 2 range.



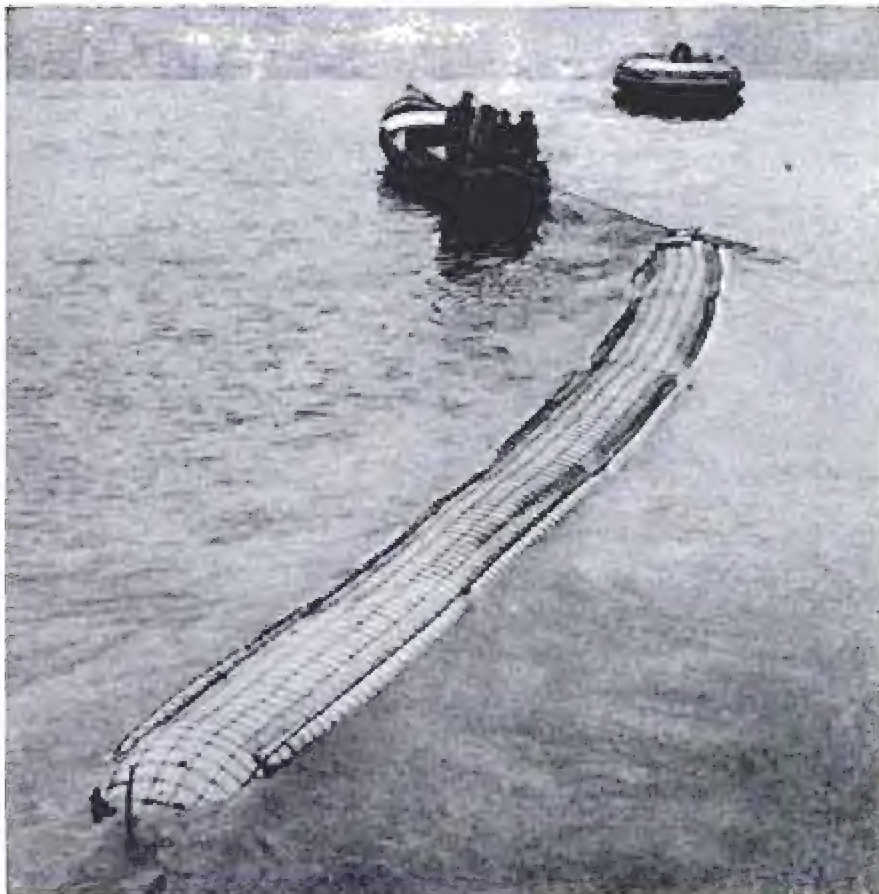


Photos courtesy of E. I. duPont de Nemours & Co., and ~~Rohm and Haas~~ ^{REICHOLD} Chemicals, Inc.

Liquid Cargoes Travel in Big Plastic Tubes

FLUID COMMODITIES, from molasses to fuel oil, are being shipped in giant "tooth-paste tubes" made of plastic or synthetic rubber. The tubes can be carried on flatbed trucks and railway cars or towed through waterways. A German plastic bag has a

capacity of 20,000 gallons. It is 100 feet long and has sealed air compartments for buoyancy. A Neoprene tube made in the United States holds 3800 gallons (top photo) and rolls into a package only two feet thick when empty (lower right).

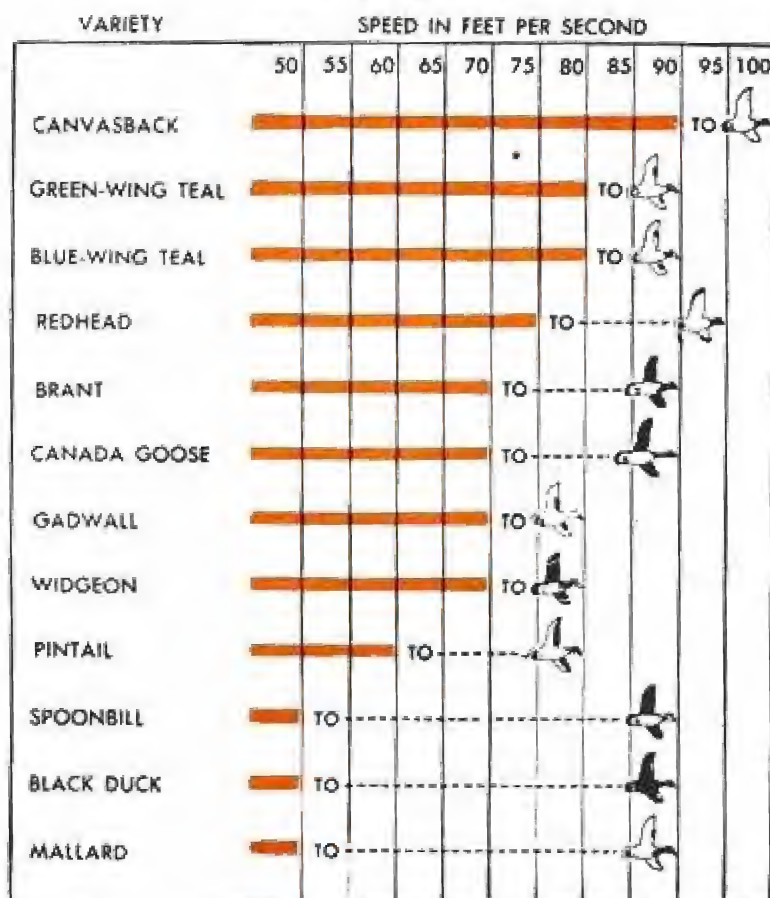




Top moment of hunting: The hike home after a fine day in the field, with birds to prove your prowess

IMPROVE YOUR

SPEED OF WILD FOWL



Courtesy Olin Industries

NO BIRD HUNTER can score every time. If he could, wing shooting wouldn't carry the challenge and excitement it holds for the thousands of hunters who take to the fields every year.

But any bird hunter, beginner or old-timer, can improve shooting and bring home more birds if he takes steps to correct his weak points. Shooting, like any other sport, calls for practice. Joe Heistand, a farmer of Hillsboro, Ohio, has racked up some of the most impressive records in the history of scattergunners. He says, "Wing shooting is like playing basketball; you don't just practice during the game."

Heistand once broke 1404 consecutive registered clay targets. It's a world record that will likely go untouched for a long time. Last year he won the coveted High Over All at the Grand American

How much to lead depends upon speed of target. Here are typical wild-fowl speeds



In one smooth, uninterrupted movement gunner should place feet, bring up gun, lead the target and fire

WING SHOOTING

By George Laycock

Trap Shoot at Vandalia, Ohio. There's no doubt that he's one of the best shots in the world.

Few hunters can expect to duplicate Heistand's scores, but by checking up on what he and other top shooters have learned about gun handling they can improve their own shooting. And it pays off in hunting satisfaction—more clean kills and fewer clean misses.

"If you shoot enough," says Heistand, "hitting a target becomes almost as automatic as hitting your mouth with your fork." But there's no use shooting a lot unless you shoot properly. The time to figure out what may be causing some of those misses is before you get into the field.

Your whole body, from feet to brain, plays a part in shooting. What you're aiming to do is send a small pattern of shot out at the right time and place to intercept a target. And that takes more than just point and pull.

Your feet should be fairly close together with your right foot 12 to 18 inches behind your left. Your body leans forward slightly, your head is up and your eyes (both of

Left hand should be under gun at a comfortable distance, right elbow held high, stock against cheek





In the "pointing out" method, bring the gun up behind the target, swing through the target to the proper lead, then fire

Feet should move automatically into position, right foot 12 to 18 inches behind left. Body should be leaning slightly forward



which are open, of course) are on the target. Whether you're shooting a clay bird or a feathered target you have to be alert. "One of the most important things," says Heistand, "is to be ready to go through the motions of aiming and firing. With a grouse, for instance, you don't have much time to make up your mind."

Relax!

Almost as important is being relaxed. This comes with practice; the more you shoot and the more wing shots you've tried, the less tense you're likely to be at the critical moment when a bird appears.

How you hold a gun is highly important to good shooting. Hold it firmly in both hands so that hands and arms absorb some of the recoil. Assuming you are right-handed, the left hand should be under the gun at a distance that feels comfortable. If your left hand is too far out you'll swing too slowly. If it's too close to your body you're likely to swing fast and unsteadily.

Your right eye should be on the target and you should raise the gun into this line of sight. The stock should rest solidly against your right cheek. Raise your right elbow so your arm is approximately parallel with the ground.

Learn to bring the gun up to your cheek instead of bringing your cheek down to the gun. Once the gun is in position, always move it and your head as a unit, so the shot will go where you're looking.

Once you've learned how to handle a gun properly, the problem of hitting fast-moving game is half solved. But the other half can cause trouble, too. Snap shooting is the technique of bringing your gun up and aiming at the spot where you estimate the bird will be when the shot gets there. A far better method is one called "pointing out" the target. Here you determine the direction the bird is flying, swing your gun to your shoulder and cheek, bring the gun up behind the target, pass on through it to get the proper lead, and fire. It's one long, uninterrupted motion. If your calculations were right, shot and bird meet.

At this point you should take a rapid accounting of other factors.



The wing shooter must be both alert and relaxed, ready to point the gun the instant the bird is flushed

Joe Heistand calls it concentration. Actually it's a combination of concentration and past experience. It's almost a sixth sense. You consider what the wind will do to a bird's speed, whether it's climbing, and where it might be headed.

Understand Shot Patterns

To know exactly how much you should lead a target you should first understand the pattern of the shot you're sending after it. The killing pattern from a 12-gauge full choke at 40 yards is about 30 inches in diameter. At 30 yards it's only 23½ inches. And it's within this pattern of shot that your target must fly if you're to score. The ideal range for a shot with a gun equipped with full choke is from 30 to 50 yards, for one with modified choke from 26 to 42 yards and for an improved cylinder gun from 19 to 30 yards.

Remember that you'll have to lead every moving target you shoot at unless it is moving straight away from you on an even plane. If you're in doubt about how much to lead, lead more than you think is necessary. Figure your lead from the front of the target. You don't kill a pheasant by shooting through his long beautiful tail feathers.

And of course the distance you'll have to lead your game depends also on its speed at the moment you shoot. A slow-flying bird, for instance one climbing into a head wind, may call for no more lead than half the pattern width. On the other hand a canvasback passing over with the aid of a tail wind may be way out in front of the shot unless you lead it by at least half a dozen pattern widths.

There are several methods you can use to get in a little valuable preseason prac-

tice. Skeet and trap shooting are helpful. Or you and a companion or two can take a hand trap and a box of clay birds out and throw them for each other. One advantage of this is that you can practice any shots that give you trouble.

And now with the basics out of the way you're ready for a try at the real thing. In bird hunting it always helps to have an understanding of the game and what it can be expected to do. "You have to anticipate a bird," says Joe Heistand. "You have to concentrate and expect him to come out where you don't happen to be looking at the moment. You have to be ready."

The bobwhite quail is an ideal target and a real challenge to the gunner. They're most common around the fence rows and heavier cover on our agricultural lands. Once the covey or the single is in the air, don't hurry your shots. These targets usually give you time to aim well, and still bring your birds down within 30 yards, the distance within which most quail are taken. The best size shot for quail is No. 7½ or 8.

The big, gaudy, ringneck pheasant is a tough bird to kill. You need at least a 20-gauge or bigger for hunting him successfully. Use No. 6 shot and don't shoot at him when he's beyond your maximum effective range.

When a pheasant first flushes he spends

(Continued to page 224)

UPLAND SHOOTING

	Shot Size
Woodcock and rail.....	8 or 9
Dove, quail, and small winged pests....	7½ or 8
Pheasant, prairie chicken, grouse, rabbit, squirrel.....	4, 5, 6, or 7½
Duck.....	4 or 6
Turkey and large furred vermin.....	BB, 2, or 4

Courtesy Olin Industries



Giant Jigsaw Radome for Dew Line Can Be Put up in 1½ Days

Standing 40 feet high, the first ground-based laminated radome has been built for Dew Line and other radar bases. It has a 50-foot base diameter and 55-foot equato-

rial diameter. Fire and weather-resistant, the radome can be knocked down and shipped in a C-124 or C-119 aircraft, then erected by six men in 1½ days.

Build-It-Yourself Plane Available in Kit Form for Just \$1000

You can build a plane for just \$1000. The propeller and Volkswagen engine to power it will cost an additional \$630. Able to cruise at 65 miles per hour, the craft has

wooden wings with single square-section spar to simplify construction. The plane weighs just 360 pounds and takes off and lands at 38 miles per hour.



see MAY 58 '77



Transparent Bait Container Lures Insects Into Tweezers

Fishermen can retrieve insects easily when using a transparent bait container. Made of a sheet of plastic, the container has two patterns of holes punched in a pyramidal shape. The holes provide ventilation and are a one-way "street" for the insects. At the top of each pyramid they enter the lips of a tweezer lined with foam plastic. The fisherman removes the tweezer and baits his line.

Plastic Holder Guards Thermos

Safety slogans to the contrary, you can drink while driving, if the drink is coffee and it's kept handy in a vacuum bottle that fits in a holder along-side the driver. Made of an unbreakable plastic, the bottle holder slips between the seat cushions and requires no other attachment. It can be used in either the front or rear seat and will not be jarred loose by road bumps, nor will it tip on fast turns.



Interlocking Plastic Mat Forms Into Many Shapes

Many different sizes and shapes can be formed from a plastic floor mat made in England of four-inch squares with interlocking tabs and slots, the material can be cut with a sharp knife. It comes in eight colors and is especially suitable for car and bathroom floors and for boat decks.

Radio Television Electronics



Exciting New Phonograph Records Initiate **THE BIG SWITCH TO STEREO**

By Lothar Stern

IN AN ERA boasting such world-shaking advances as atomic power, supersonic aircraft and earth satellites, the mention of a mere phonograph record may seem trivial. In audio circles, however, and to music lovers the world over, the evolution of the stereo disc and the subsequent development of suitable playback equipment is just about the biggest thing that's come along since the advent of high fidelity. For here, at last, is a popular and popularly priced record which combines the perfection of high-fidelity sound with the directional effect and spaciousness of stereo—a combination which promises to remove the last barrier between reproduced music in the home and true concert-hall realism.

To anyone hearing stereo for the first time, the effect is truly dramatic. Almost like magic the entire orchestra seems to be spread out ahead. Gone is the "point source" effect associated with single-channel reproduction. As though a wall with a small hole in the center were suddenly removed from in front of an invisible orchestra, all instruments arrange themselves in their proper relative positions—an illusion so real that the reproduction almost rivals the original rendition as heard from the best seat in the auditorium.

The mechanics of stereophonic perception are simple enough. Consider, for example, the illustration in Fig. 1 which corresponds to ordinary single-channel, or

monaural reproduction. Here a single microphone is placed in front of a large orchestra. The microphone picks up all sound and converts it into a single electrical signal. This signal is then amplified and reconverted into sound waves by a loudspeaker.

But, while a good microphone can translate a complex sound wave into an exact electrical replica, it can not differentiate between sounds coming from either the left or the right. A sound originating at the extreme left, therefore, produces the same electrical output as an identical sound originating at the extreme right. The perception of depth is interpreted merely as a change of intensity so that an instrument playing at some distance away, regardless of its position, sounds as though the instrument were playing directly in front of the microphone at reduced volume. When all sounds of an entire orchestra are converted into a single electrical signal and reproduced through a loudspeaker, the feeling of depth and all indications as to the relative positions of the various instruments are lost.

The Illusion of Stereo

Fig. 2 shows a somewhat similar situation involving the use of two separate microphones and two loudspeakers. Here, each microphone covers only one half of the area with some overlap in the center region. Before being applied to the speakers, however, the two individual microphone signals are mixed in a common amplifier. Each speaker, therefore, receives the composite signal as if only one microphone were employed to cover the entire orchestra. This effectively nullifies any advantage gained through the use of two microphones, but it does produce some interesting results. Since each speaker now produces the same sound, a listener midway between the two receives exactly the same signal with his left ear as he does with the right, *just as he would if the sound source were directly in front of him*. But, while the apparent source of sound now shifts to a position between the two speakers, it still contains no trace of the original orchestral "spread."

In Fig. 3 we have the conditions necessary for true stereophonic perception. Again, two microphones and two loudspeakers are employed, but this time each microphone signal is individually amplified by a separate amplifier. As a result, a listener hears the left section of the orchestra reproduced by the left speaker and the right section by the right speaker. The center section which is picked up equally by both microphones produces the same

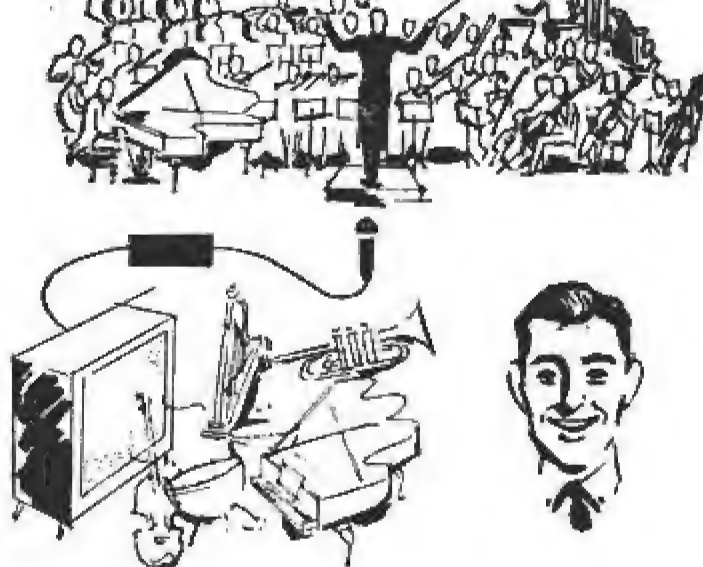


Fig. 1. In ordinary monaural or single-channel reproduction, all sounds from an orchestra are mixed and reproduced through a single speaker. A listener hears all sounds coming from a single point source

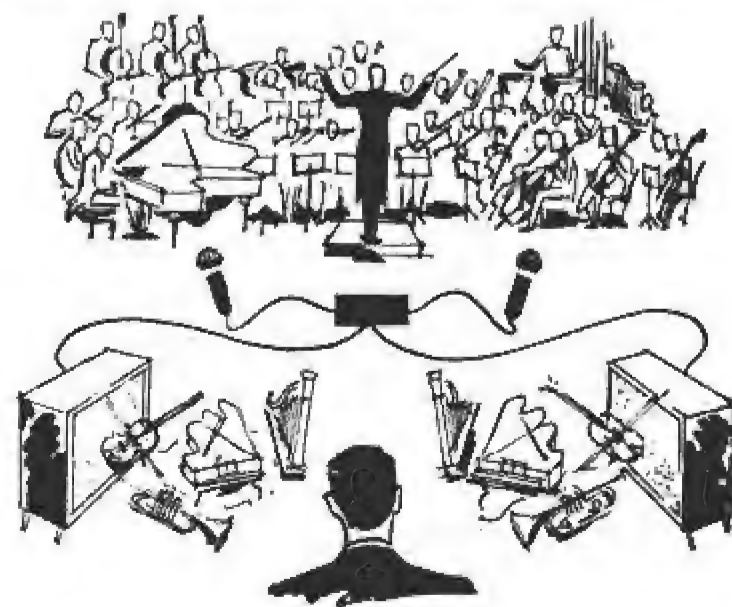


Fig. 2, above. When two microphone signals are mixed in one amplifier and reproduced by two speakers, the resultant sound is still a point source but seems to come from a position midway between the speakers. Fig. 3, below. True stereo reproduction requires two separate, independent sound channels



sound from both speakers and seems to be coming from a point directly between the two, *just as though the listener were seated directly in front of the orchestra itself.*

Stereo in the Home

Stereo recordings have been with us for quite some time. In recent years all original recordings have been made on magnetic tape using two or more microphones. The output from each microphone is separately recorded on individual tape tracks and the multichannel-tape masters are used to produce commercial stereo and monaural tapes as well as single-channel discs. Today, anyone willing to invest in a stereo-tape player and pay the comparatively high price for stereo tapes can build up a sizable library of musical recordings which present the ultimate in the reproduction of recorded sound.

But sound on tape has not captured the fancy of the multitude of music lovers. The phonograph record still commands a lion's share of the high-fidelity market. And that is why the evolution of the stereo disc is causing such a stir in the musical world.

The concept of stereo sound on discs is not new. As far back as the late '30s a system was developed for recording two separate audio channels in a single record groove. The system used recorded the information received from one microphone in a lateral, left-to-right direction and the information from the other in a vertical, up-and-down direction. In playback, the

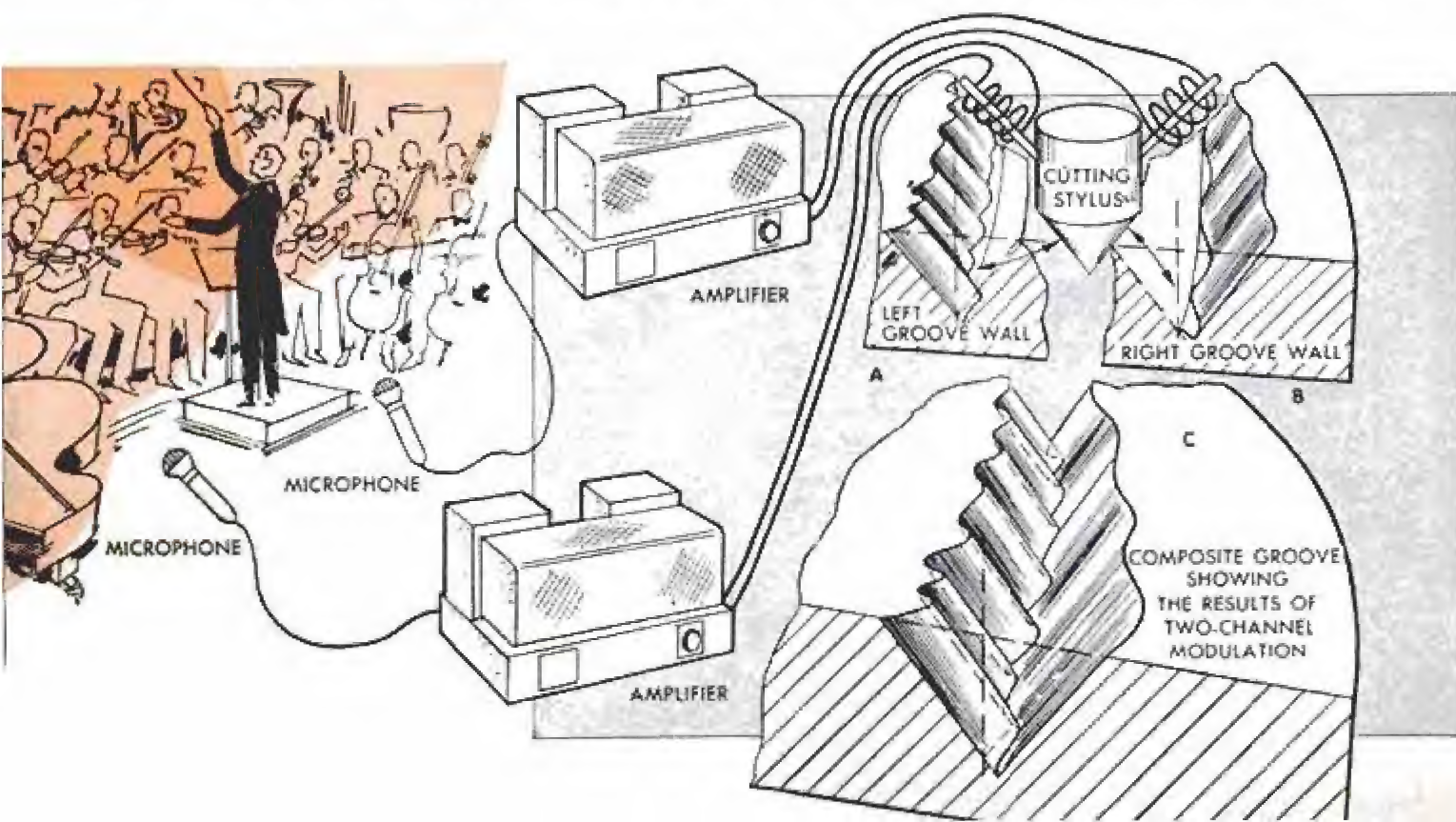
pickup cartridge separated the two channels and, feeding each signal to a different amplifier and speaker, produced true stereo sound. But the industry was not yet ready for stereo. Neither the quality of the record material, nor that of the cutting head permitted satisfactory recordings of this type and the system was shelved.

Later, an attempt was made to record stereo on discs by using two separate sets of grooves, each containing the information from a different microphone. This method required two separate and carefully ganged pickup cartridges and was so critical in adjustment that it, too, had to be quickly discarded.

After failure of the separate-groove discs, nothing was heard of stereo records for several years, but interest in stereo reproduction continued to rise. Stereo tapes became available and enjoyed increasing popularity. Radio stations began experimenting with stereo by simultaneously transmitting the same musical programs on AM and FM. The FM station broadcast the audio picked up by one microphone while, at the same time, the signals from another microphone were transmitted via AM. Stereo reception could be obtained by employing both an FM and an AM receiver. Broadcasts of this type are currently available in some sections of the country on a limited basis.

In the last year or two, a system of multiplexing two separate audio channels on a single FM carrier has received considerable attention. With this system, a single

Fig. 4. The Westrex method of cutting stereo discs: Signals from one microphone cause the cutting stylus to cut into the left groove wall, A, at a 45-deg. angle. Signals from the other microphone modulate right groove wall, B. Composite signal, C, causes simultaneous side-to-side and up-and-down groove variations



FM receiver in conjunction with an inexpensive multiplex adapter can provide stereo reception. But multiplexing, while seeming to provide the ultimate answer to stereo broadcasts, is still in the experimental stage. When and if this method will finally be adopted for popular stereo purposes still is a matter for speculation.

Finally, toward the end of last year and in the early months of 1958, the demands for a readily available and compatible source of stereo were met. In close succession several companies announced and demonstrated the successful recording of two separate audio channels in a single record groove. It seemed, for a while at least, that the public might be confronted with several types of stereo records, each requiring a different reproducing system. But this time the record industry, remembering the mistakes of earlier years, adopted a standard. By international agreement it was decided to use the system demonstrated by Westrex, the so-called 45-45 system, for cutting all stereo records.

How Records Are Cut

The Westrex method of recording is really a modification of the old lateral-vertical system. Instead of driving the cutting stylus in an exact vertical and lateral direction, however, the two applied signals cause the stylus to move diagonally, at 45-deg. angles. In the detail of Fig. 4, a signal applied to the left coil of the cutting head drives the cutter diagonally to the right, causing it to cut deeper into the record and, at the same time, displacing the groove in a lateral direction to the right.

A signal applied to the right-hand coil causes a similar excursion to the left. Thus, the two signals effectively modulate opposite walls of the groove and the result of combining the two actions produces a single groove which is displaced laterally as well as vertically from the norm.

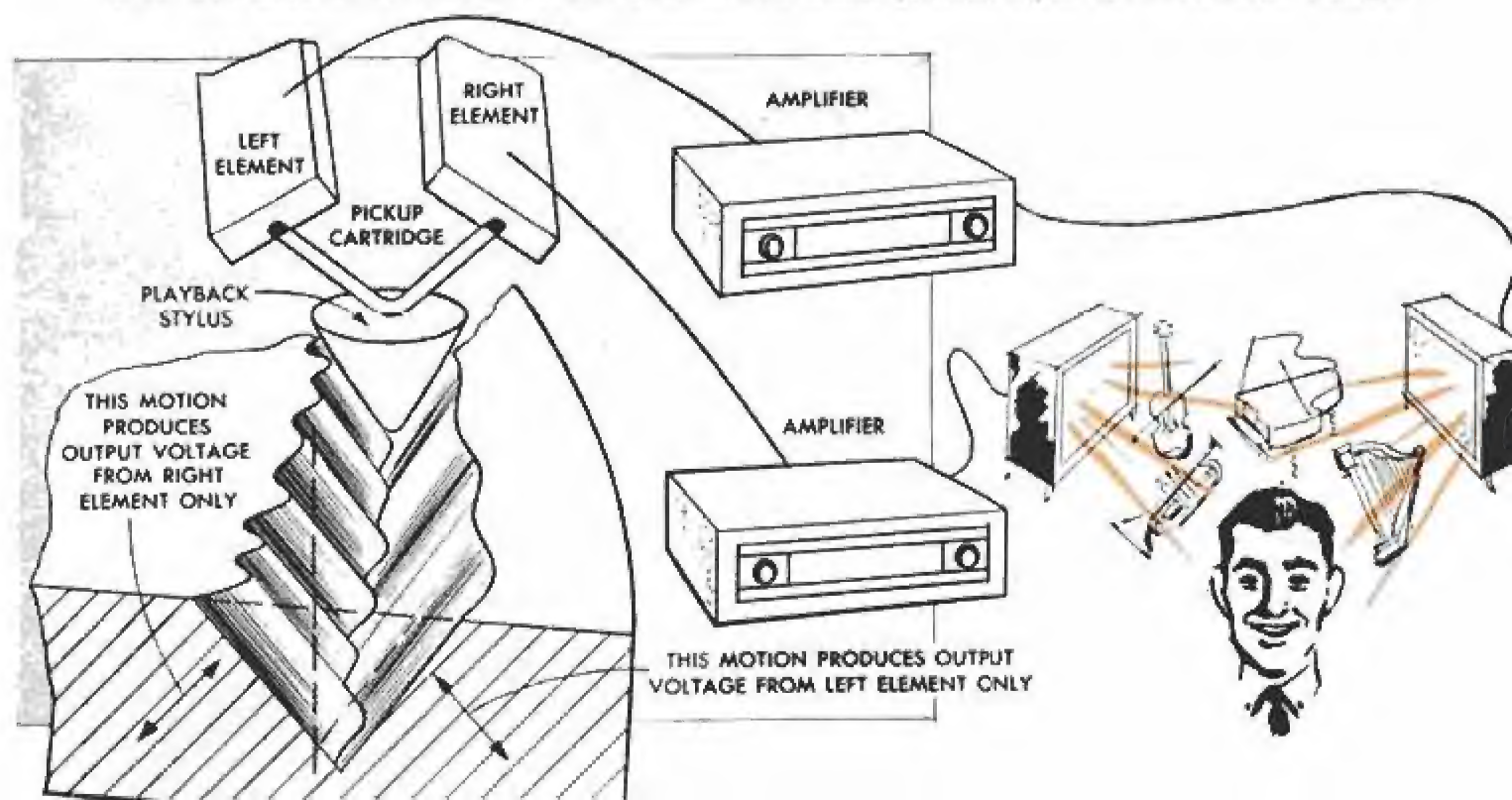
The action of a typical stereo pickup cartridge is illustrated in Fig. 5. Here, use is made of two sensing elements which are mounted at 45-deg. angles. (Ceramic elements are shown here but the same theory also applies to magnetic cartridges. Both ceramic and magnetic units are currently available.) Each element produces maximum output voltage only when flexed in a direction perpendicular to its plane and is insensitive to signals cut the opposite direction. By utilizing the separate output voltages from the two elements, we recover the two separate signals initially supplied by the microphones. When these are applied to individual amplifiers and speakers, we have the necessary requirements for stereo reproduction.

Compatibility of Stereo Records

For complete compatibility, the stereo cartridge must be able to reproduce a monaural record as well as stereo discs. This requirement is met by present stereo cartridges without reservations. But, ideally, a stereo record should also be reproducible with a standard monaural cartridge. Here, the situation is somewhat more complicated. Normal monaural cartridges permit the stylus to move easily from left to right as is required for all monaural record

(Continued to page 228)

Fig. 5. Recovering two separate audio channels from single record groove requires two sensing elements in the pickup cartridge and two separate amplifier-and-speaker systems. Voltage output from each element varies with direction of stylus movement. Up-and-down motion produces equal but out-of-phase voltages





1. NEW YORK'S PARK POLICE will soon have a powerful new weapon for combating crime. Patrolmen demonstrate latest radio equipment which enables wearer to summon help from any spot on his beat. Transmitter, left, has a range up to 2 miles and permits instant communications with receiver-equipped officers, right, or with any fixed police radio station

Courtesy Radio Corp. of America

2. FROM MILAN, ITALY, comes this new look in television receivers. As one of its contributions to the second U.S. World Trade Fair, Italy presents a TV set with a movable picture tube. Screen can be rotated a full 360 degrees and tilts to any desired angle for easy viewing from any position in the room

FIMI, VIA SAUL BANFI #1, SARGANO, ITALY

3. LATEST DEVELOPMENT in home communications is featured in this transistorized combination intercom, radio and chime system. Used with up to eight substations, unit permits instant conversation between any rooms in the house. Radio programs may be channeled to any or all rooms and door chimes can be heard with ease from any desired location

The Rittenhouse Company, Honeye Falls, N. Y.

4. NEW FM TUNER, available in kit form, offers a number of "firsts" to do-it-yourself hi-fi enthusiasts. Kit includes completely wired and prealigned "front end," simplifying construction and adjustment. Novel traveling tuning indicator turns into exclamation point when station is correctly tuned in. Advanced design offers drift-free, high-fidelity performance at low cost

Electronic Instrument Co., Inc., 32-00 Northern Blvd., Long Island City 1, N. Y.

5. ENJOY HI-FI OUTDOORS with new weatherproof garden speaker. Unbreakable mushroom-shaped top protects back-loaded professional-quality speaker and provides 360-degree tone beam. Speaker connects to any hi-fi amplifier and fits into any setting

Shalida Mfg. Co., 150 W. Providence Ave., Burbank, Calif.

COAT AND BOOT RACK FOR YOUR HALL

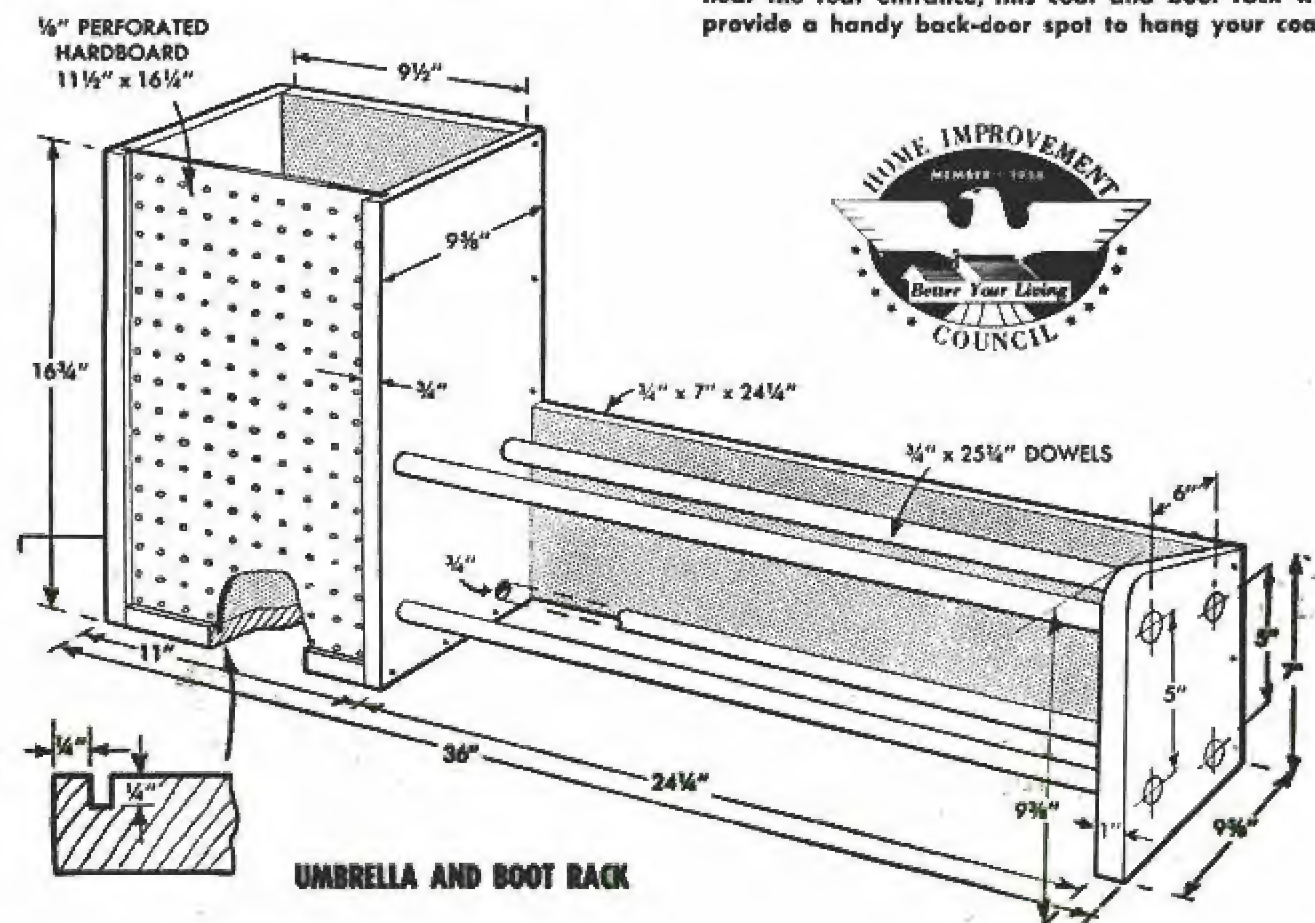
By John Bergen

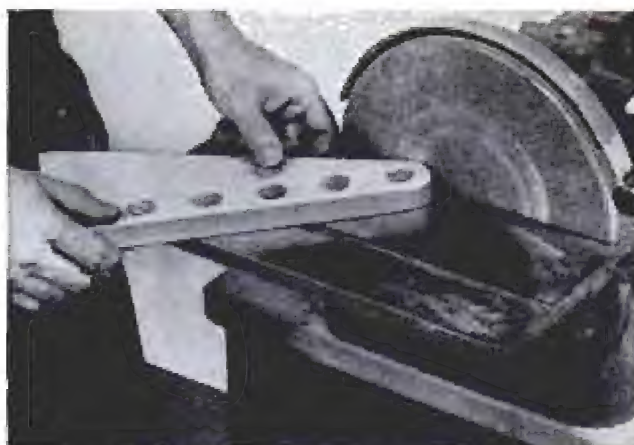
WHERE TO HANG the family's everyday coats, hats and boots in a place convenient to all is a problem that faces almost every household. Few homes, if any, have closet space handy to the rear entrance, with the result that youngsters' winter togs and other family wearing apparel are hung almost anywhere. Where there is space in an entry hall, a breezeway or even at the foot of the basement stairs, this "family coat tree" will provide a central place where outer wraps can be hung and stored in neat array. Not only are there racks for boots and rubbers, as well as hats and coats, but there's a roomy holder for several umbrellas.

The drawing below shows how the umbrella and boot rack is made. This part of the complete affair is designed merely to rest on the floor although it can be anchored to the baseboard or wall with a couple of screws to hold it secure. Other than the dowel rods and the panel of perforated hardboard which forms the front of the umbrella compartment, all the parts can be cut from an 8-ft. length of 1 x 10 white pine. The sides and bottom of



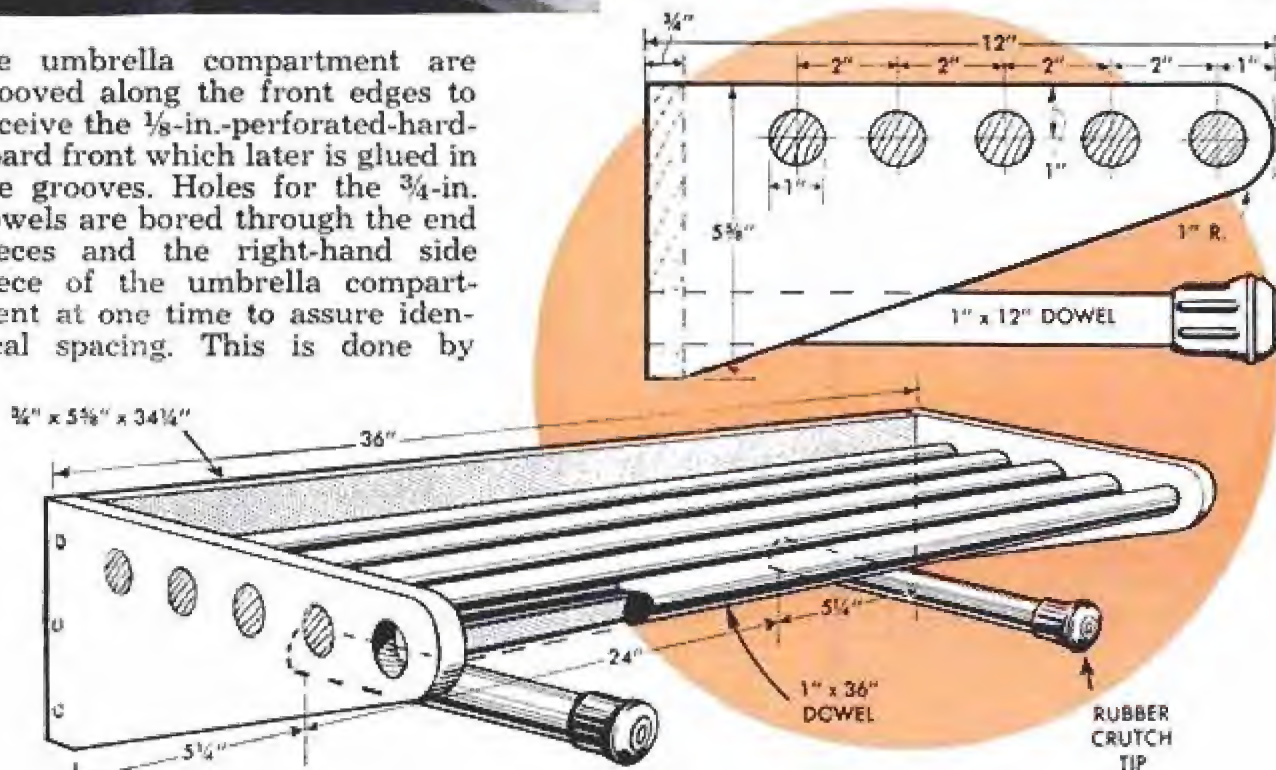
Located on a wall, in a breezeway or other location near the rear entrance, this coat and boot rack will provide a handy back-door spot to hang your coats





the umbrella compartment are grooved along the front edges to receive the $\frac{1}{8}$ -in.-perforated-hard-board front which later is glued in the grooves. Holes for the $\frac{3}{4}$ -in. dowels are bored through the end pieces and the right-hand side piece of the umbrella compartment at one time to assure identical spacing. This is done by

The hat-and-coat-rack unit detailed below is made from a 6-ft. length of 1 x 6. As before, holes for the 1-in. dowels are bored in the matching end brackets by clamping both members together and boring at one time. Hanging holes, as well as those for the coat pegs, are bored all the way through the back member. While two pegs are shown, more can be added. Rubber crutch tips pressed over the ends add a knob effect and also help to keep coats from slipping off the pegs. The five dowels that form the hat shelf are held in the end

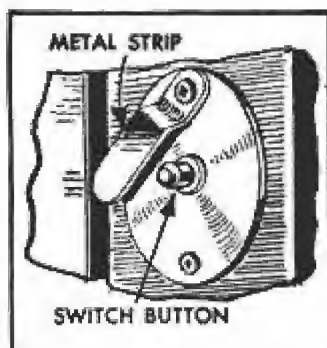


COAT AND HAT RACK

clamping or tacking the two together and boring part way from one side and then from the other to produce clean-cut holes. All the pieces are merely butt-joined, the back board of the rack being glued and nailed to the right-hand side of the umbrella compartment before the latter is assembled. This will permit nailing through from the inside surface.

brackets by driving nails down through the edges and crosswise through the dowels. Locate the rack so the hanging screws will enter wall studs, and mount it so the top of the rack is about 5 1/2 ft. up from the floor. A metal tray can be placed in the bottom of the umbrella compartment to catch drippings. The units can be painted to match or contrast with the wall. ★ ★ ★

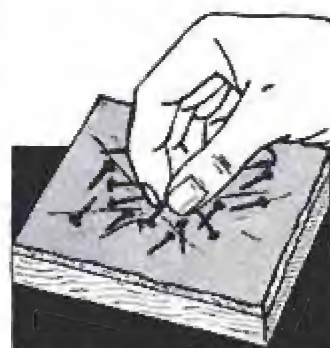
Car-Door Light-Switch Control



To "lock" car-door light switches in the "off" position to prevent illumination when it is desired to leave the doors open, attach a metal strip to each switch plate. — R. Smith, N. Little Rock, Ark.

Pick-Up Pad for Small Brads

Small brads or nails are easier to grasp when they are placed on a sponge-rubber-covered wood block as shown in the detail. For best results, use cement for attaching the rubber pad to the block.



Trammel Made From Paper Clamps and Ruler

When you need an oversize compass or trammel points, clip two paper clamps to the opposite edges of a yardstick, folding rule or a suitable strip of wood. Locate the clamps the desired distance apart and insert pencils in the holes in each clamp.

Andrew Vena, Philadelphia, Pa.

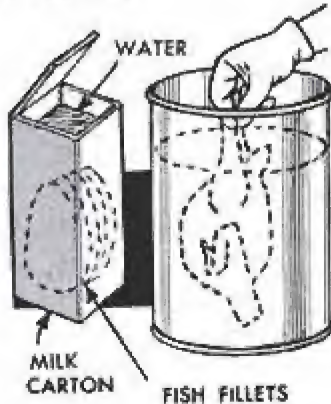
Keep Pictures Straight

Pictures hung on a wall by means of a wire slipped over a hook will stay straight if tape is wound on both sides of the center of the wire. Allow just enough space between the tape windings to accommodate the hook.



Ice Shell on Frozen Meats Seals in Original Flavor

Instead of just wrapping and quick-freezing fish fillets, fowl and game in the usual way, improved flavor will result from encasing the pieces in ice. For fish, pack a few fillets in a water-proof milk carton, fill it with water and set it in a freezer. To get equivalent results on fowl and pieces of meat, first freeze them thoroughly, then quickly dip in cold water a few times, completely immersing them to form a shell of ice.



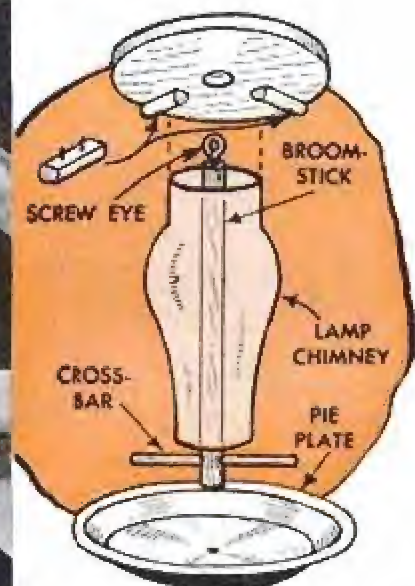
Paintbrush Bristles Reshaped By Storing in Cardboard Holder

Paintbrushes that have become misshapen sometimes can be restored with the aid of a "pocket" made of stiff cardboard or light sheet metal. After the brush has been cleaned thoroughly, it is fitted into the cardboard pocket and forced into proper shape. Hold the pocket around the brush by means of rubber bands or string. Wrap the shaped brush in paper and store.



Lamp Chimney and Pie Plate Make Hopper Bird Feeder

A novel hopper-type bird feeder that lets you see at a glance the supply of seed is improvised quickly from a pie plate, glass lamp chimney, a broomstick and a wooden cover. To refill, you simply lift off the cover. The pie plate is screwed to the lower end of the broomstick after the latter is first drilled crosswise for a smaller dowel on which the chimney rests. A hanging screw eye is driven into the upper end of the broomstick and then a wooden cover, drilled to slip down over the screw eye and broomstick, is fitted with short pieces of half-round molding to center the chimney on the cover.



X 627

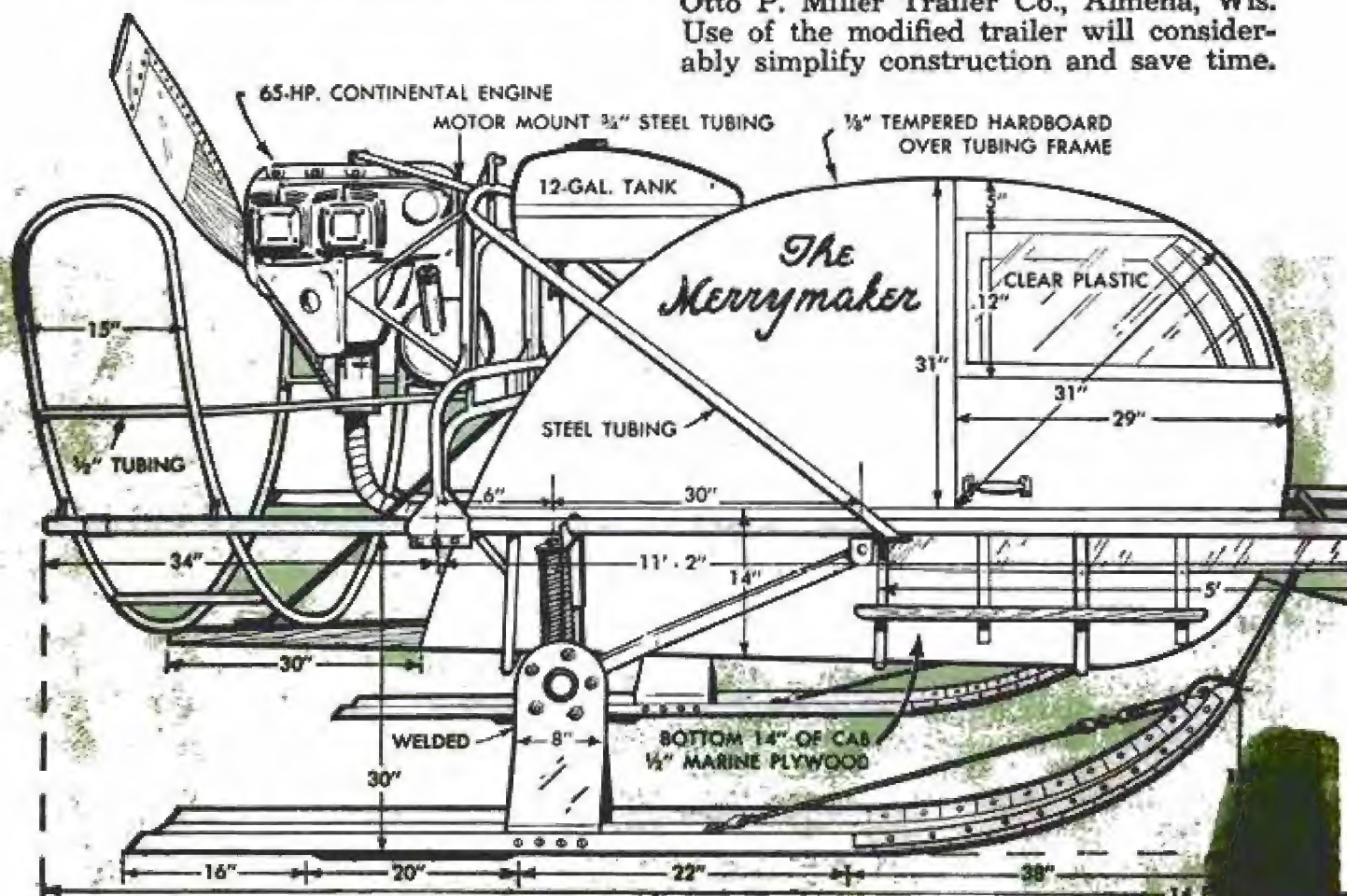
SNOWMOBILE

By Wayne M. Judy



Changing the versatile Merrymaker from a snowmobile to a "self contained" trailer that can be hauled at highway speeds behind a car takes only minutes

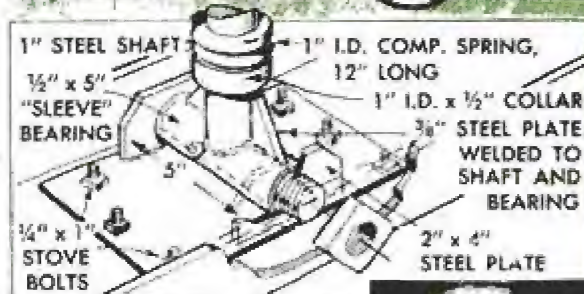
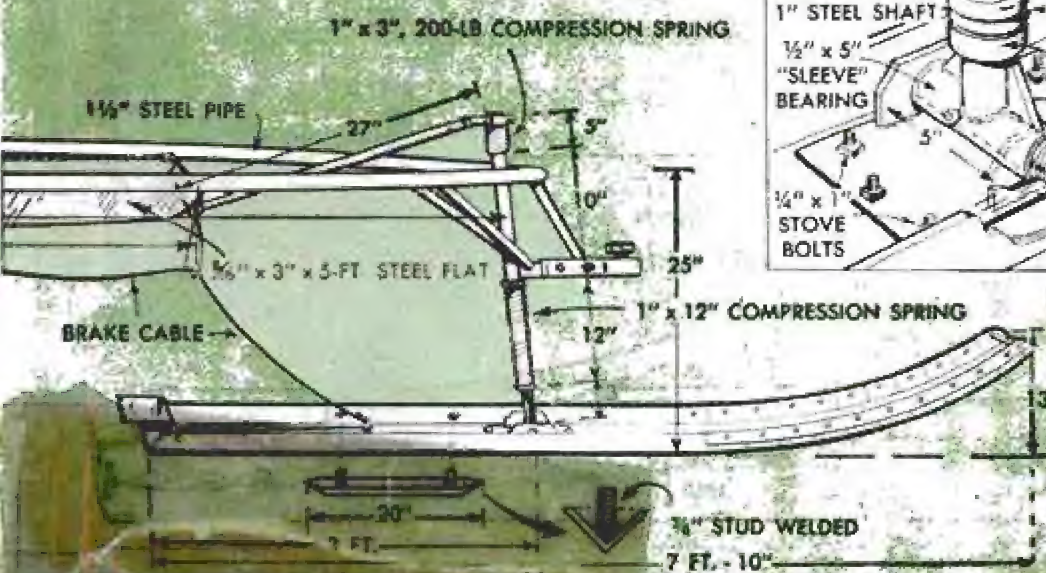
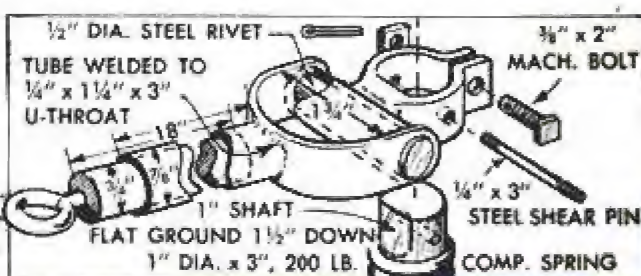
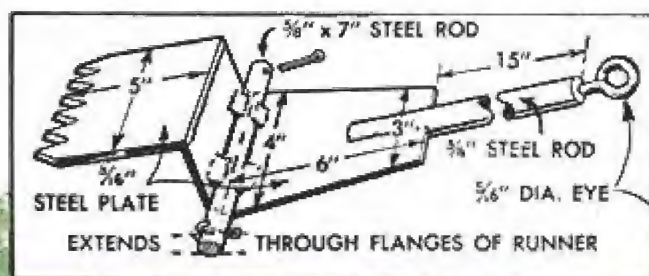
FOUR WINTERS of hard use around International Falls, Minn., and also in neighboring Canada have proved the Merrymaker snowmobile to be a practical, rugged vehicle ideal for cold climates. The thrust of a propeller driven by a Continental aircraft engine drives the vehicle over snow and ice and, when it is necessary to transport the snowmobile over dry highways, it becomes a "self contained" trailer. In about 15 minutes two men can remove the three runners, install two wheels and the unit hooks to a trailer hitch on a car for quick change of locations at highway speeds. The easy transition from snowmobile to trailer was made possible on the original because it is built on a modified boat-trailer frame. Although it is possible to build the snowmobile from the ground up by using the dimensions and drawings in this article, the modified trailer, which includes the steering mechanism and adjustable clamps for holding the mount of the aircraft motor is available from the Otto P. Miller Trailer Co., Almena, Wis. Use of the modified trailer will considerably simplify construction and save time.



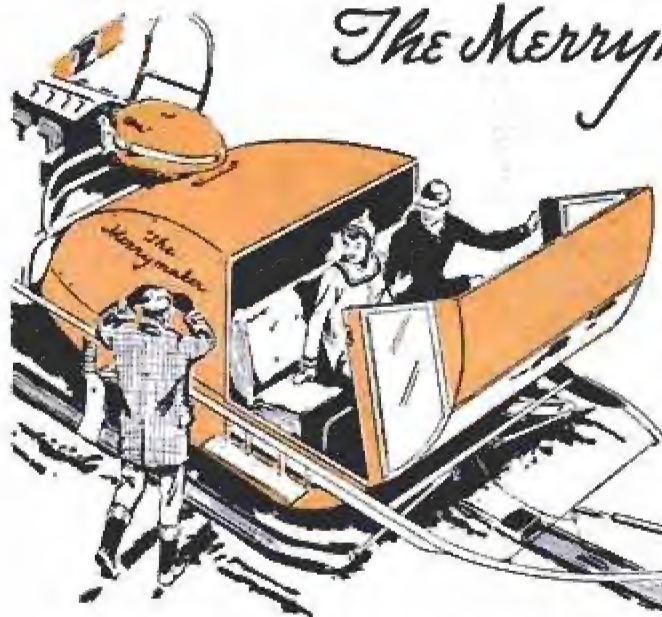


Standard Ford automobile wheels will fit the trailer hubs, and the runners are made to fit on the same hubs. The cab of the snowmobile is made by screwing sheets of hardboard to a frame welded from thin-wall conduit. The lower portion of the cab, as indicated, is made like a boat, of $\frac{1}{2}$ -in. marine plywood, so the snowmobile will float if it should break through ice and drop into water. Because the greatest amount of weight—the engine, runners and cab—are located to the rear of the vehicle, it will sink down toward the rear.

For this reason it is suggested that the joints at the rear of the cab be sealed with strips of glass-fiber cloth saturated with epoxy-resin. The complete snowmobile with full gasoline tank weighs 840 lb., the "boat hull" portion of the cab will support about 1700 lb. The brake on the steering or "tiller" runner is operated by a heavy nylon cord from the cab. It is slack enough to allow a full swing of the runner. Control of the front runner is by means of cables and a steering-wheel-and-drum assembly designed for a boat. The throttle control



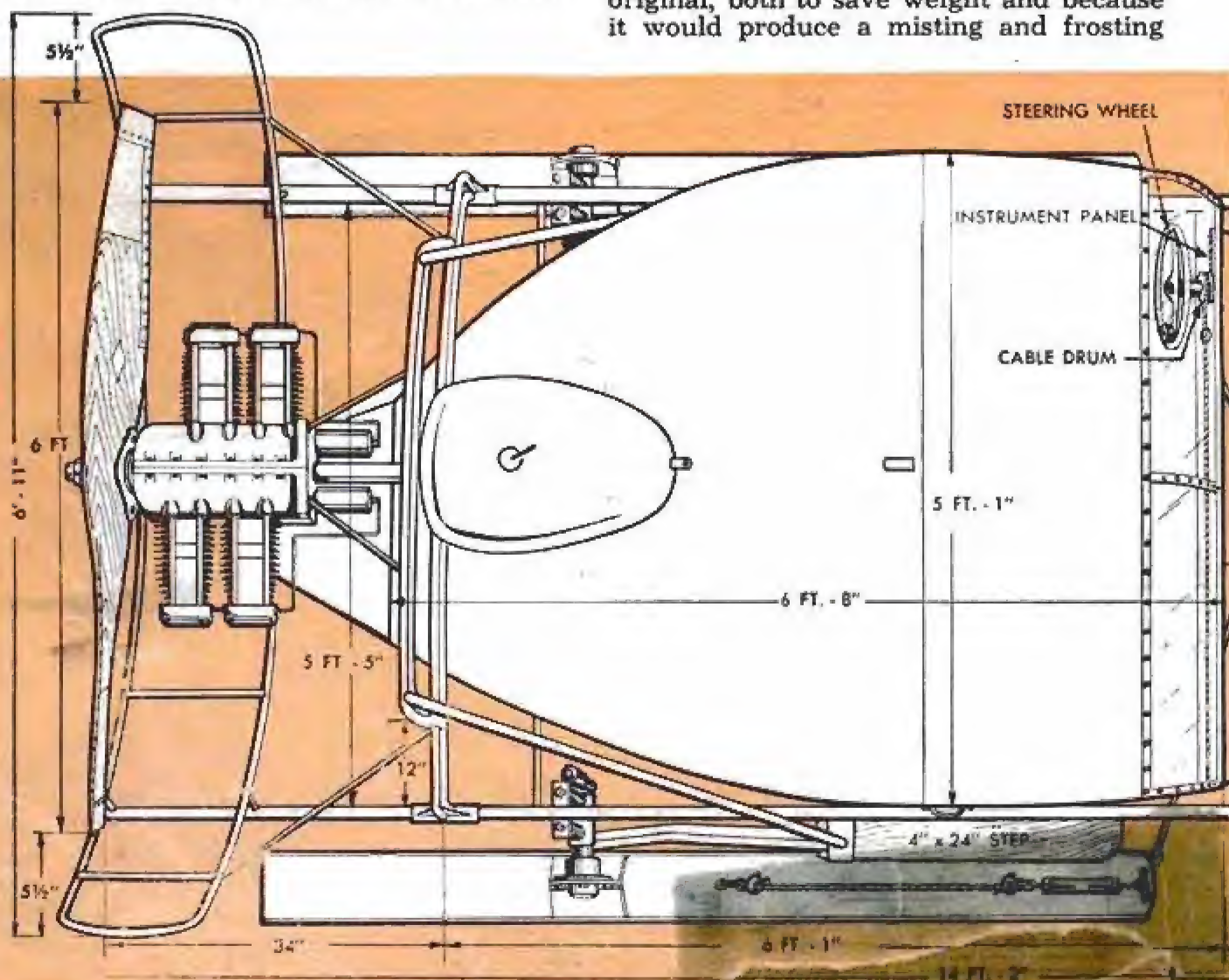
The Merrymaker SNOWMOBILE



also is the type used in a boat, and is spring-loaded to close automatically when released. All three runners are shaped from No. 6061-T6 aluminum-alloy channels. The channels are 7 in. wide with $2\frac{1}{8}$ -in. flanges, and have a web thickness of .230 in. Aluminum is used for the runners rather than wood, as the metal polishes smooth with use, and ice can be knocked

from them with a hammer. Wooden runners would require a lot of scraping.

The bends in the runners are made by first cutting a series of slots $1\frac{1}{8}$ in. deep, $1\frac{3}{4}$ in. apart. Steel cables and turn-buckles are used to pull the curves into the runners and hold them. When the forming is complete, a $\frac{1}{8}$ x $1\frac{1}{4}$ -in. flat-steel strip is bolted to the outside of each flange to strengthen the bent metal. If cold-forming equipment is available, the notching is not necessary. The turnbuckles and cables are needed on the side runners to counteract the strain of the "tie rods" that run from the tips of the runners to the cross member ahead of the cab. The forward end of the cab that tilts to permit entrance is fitted with a piano-type hinge across its full width. Neither generator nor starter is used, in the interest of saving weight. The engine starts at 40 below zero by hand-spinning the propeller, the twin-impulse magnetos of the engine furnishing excellent ignition even under the extreme temperature conditions on the Canadian border. No heater is used on the original, both to save weight and because it would produce a misting and frosting

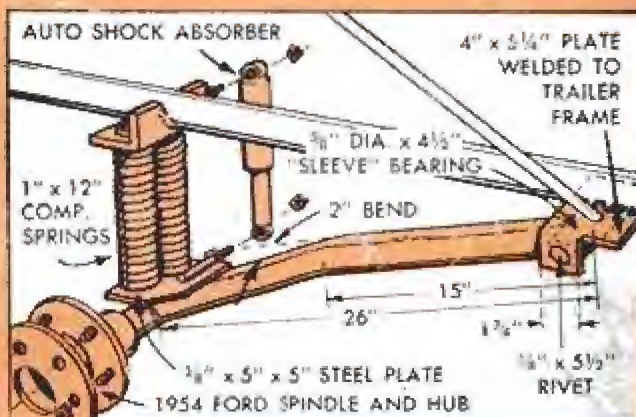
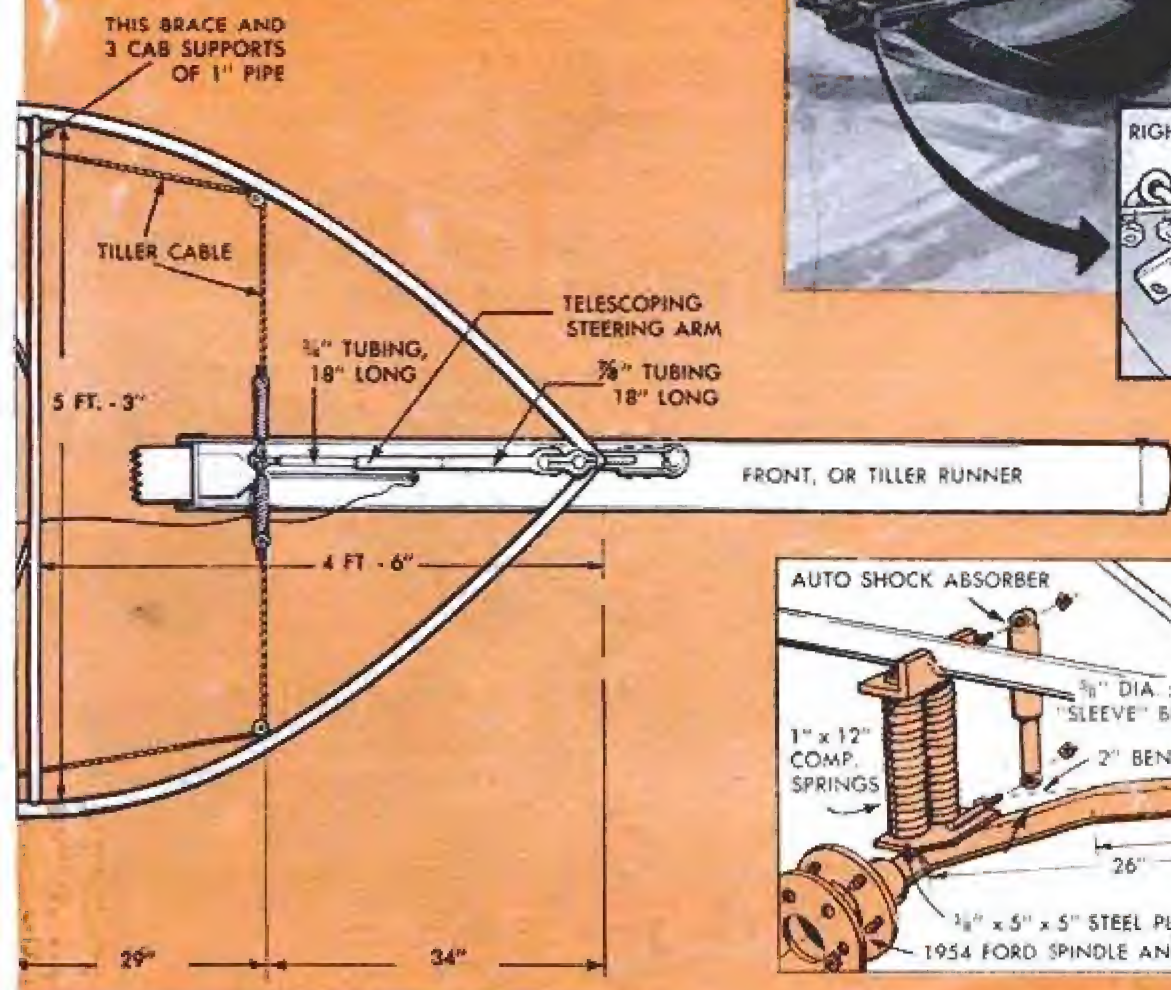
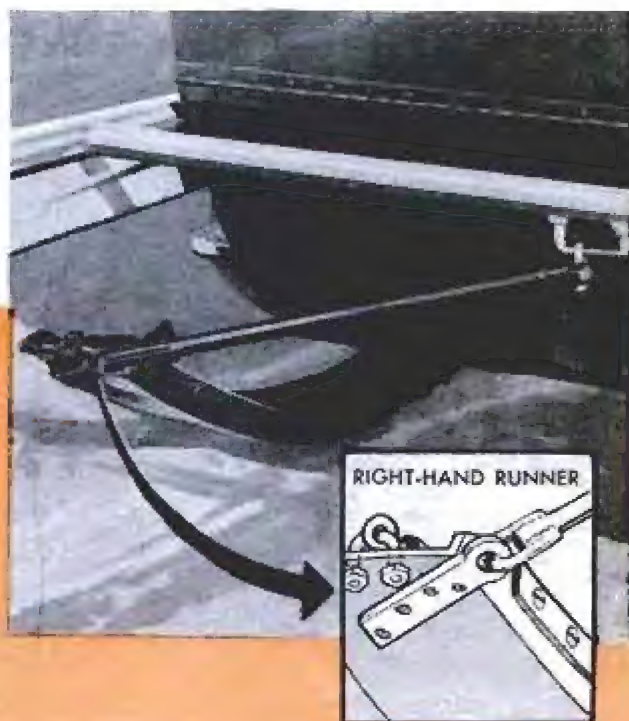


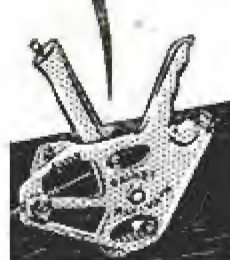


Above, with runners on auto-top carrier and wheels on the hubs of the Merrymaker, the snowmobile is trailered to new location. Below are shown details

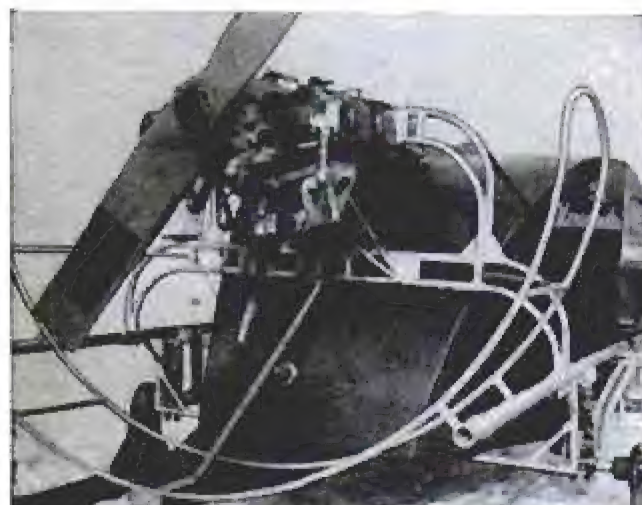
of side-runner "tie rods" and suspension system for the hubs. Suspension system is part of unit when trailer is purchased from the manufacturer

problem on windows and windshield. It is possible that a heater drawing fresh air from outside the cab would eliminate the frosting problem. Items such as this will require experimentation by individual builders. The gasoline tank is the type used on farm tractors and has a capacity of 12 gal. A power propeller is used, being 72





Above and left, steering and throttle mechanisms are types used in boats. Throttle is spring-loaded so it closes when released. In photo below, exhaust is piped through cabin to provide heat. Heater was removed as it caused frost on windshield



in. long, with a 24 pitch and stainless-steel tips. Banks-Maxwell has this propeller under catalogue Number 670-24. The instrument panel of the cab is a piece of hardwood 5½ in. wide and 60 in. long. It is held in place by a length of ½ x ¾-in. aluminum flat. The bottom edge of the panel is 20 in. above the floor, and there is a tool compartment in place of the usual glove compartment in an auto instrument panel. Auto seats can be used in the Merrymaker to permit seating 4 or 5 persons, although these seats are fairly heavy. Light tubing and plywood could be used to make lightweight seats with foam-rubber cushions. If the snowmobile is to be used as a work vehicle, a single seat for the driver is all that is needed, the rest of the cab being left open for cargo space. Stretchers convert snowmobile to an ambulance. ★ ★ ★



Adjustable-Height Sack Holder Speeds Filling With Shovel

Sacks can be filled quickly to any height when clamped to this adjustable holder. The base of the holder is a section of wheel rim to which a length of pipe is welded. A smaller pipe that "telescopes" inside has a U-shaped bracket of flat steel welded to it. Four spring-type battery clamps bolted to the bracket hold the sacks. A bolt fitted in holes drilled in the pipes adjusts the height of the holder. To prevent mislaying the bolt, it is held by a length of chain.

Correct Warming of Engine Protects Valve Lifters

Never race a cold engine, but let it run at fast idle, as determined by the automatic-choke mechanism. This lower speed allows time for oil to circulate completely through the engine. This is especially important for hydraulic valve lifters, because running an engine at high r.p.m. with partially filled lifters could force the plungers into a cocked position in the lifter bodies.

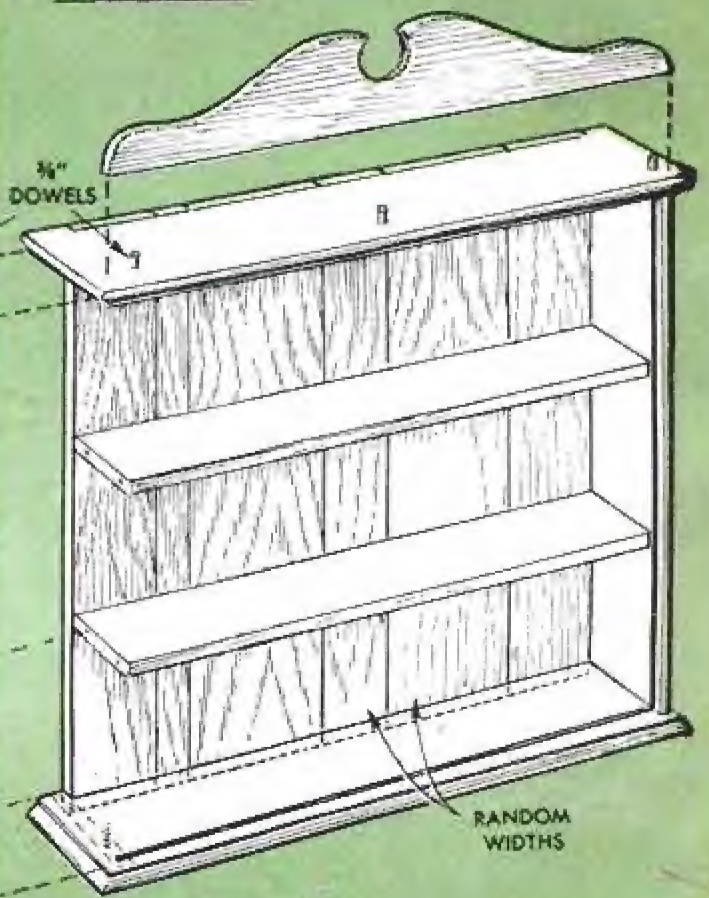
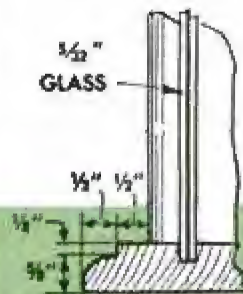
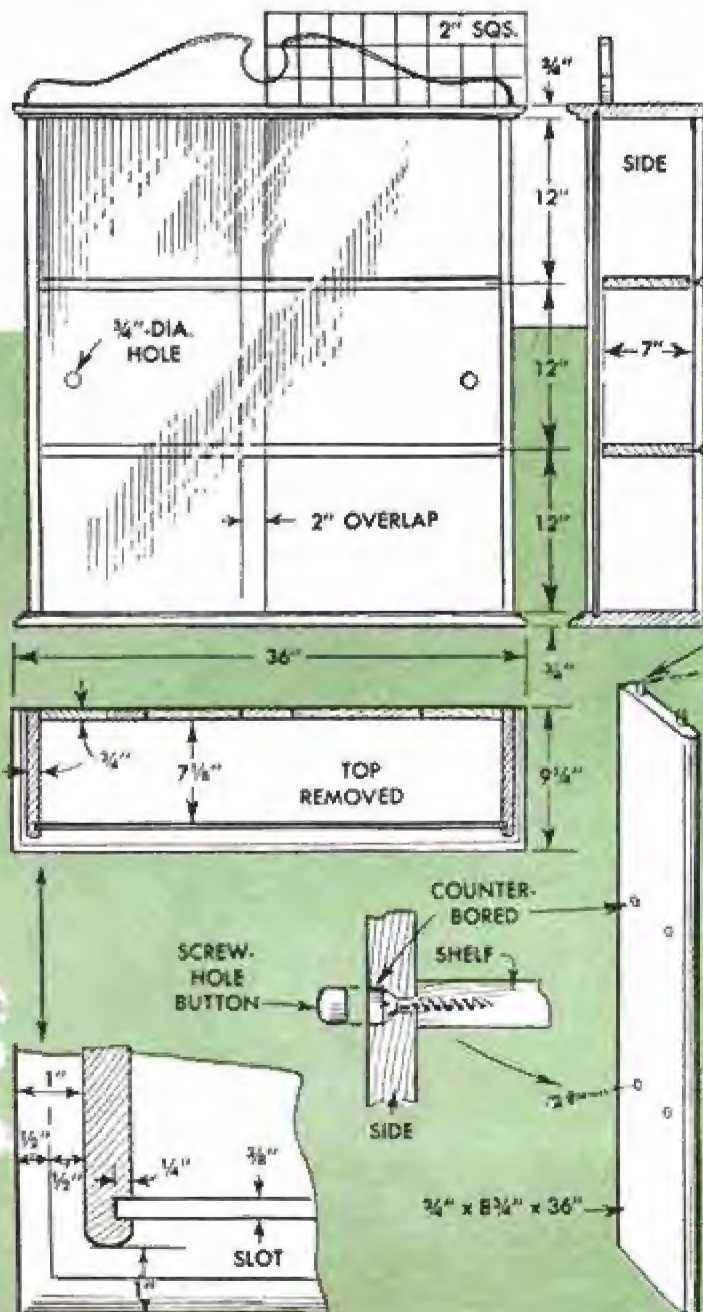
Champion Spark Plug Co.

Plywood "Plastered" With Paint

If you have a ceiling or wall of plain plywood that you wish to give a plastered appearance, here is an easy method: Paint the surface with a texture paint, brushing it on heavily. Then, carefully "trowel" the surface with a flat sponge while the paint is still wet. When dry it will appear to be a plastered surface.

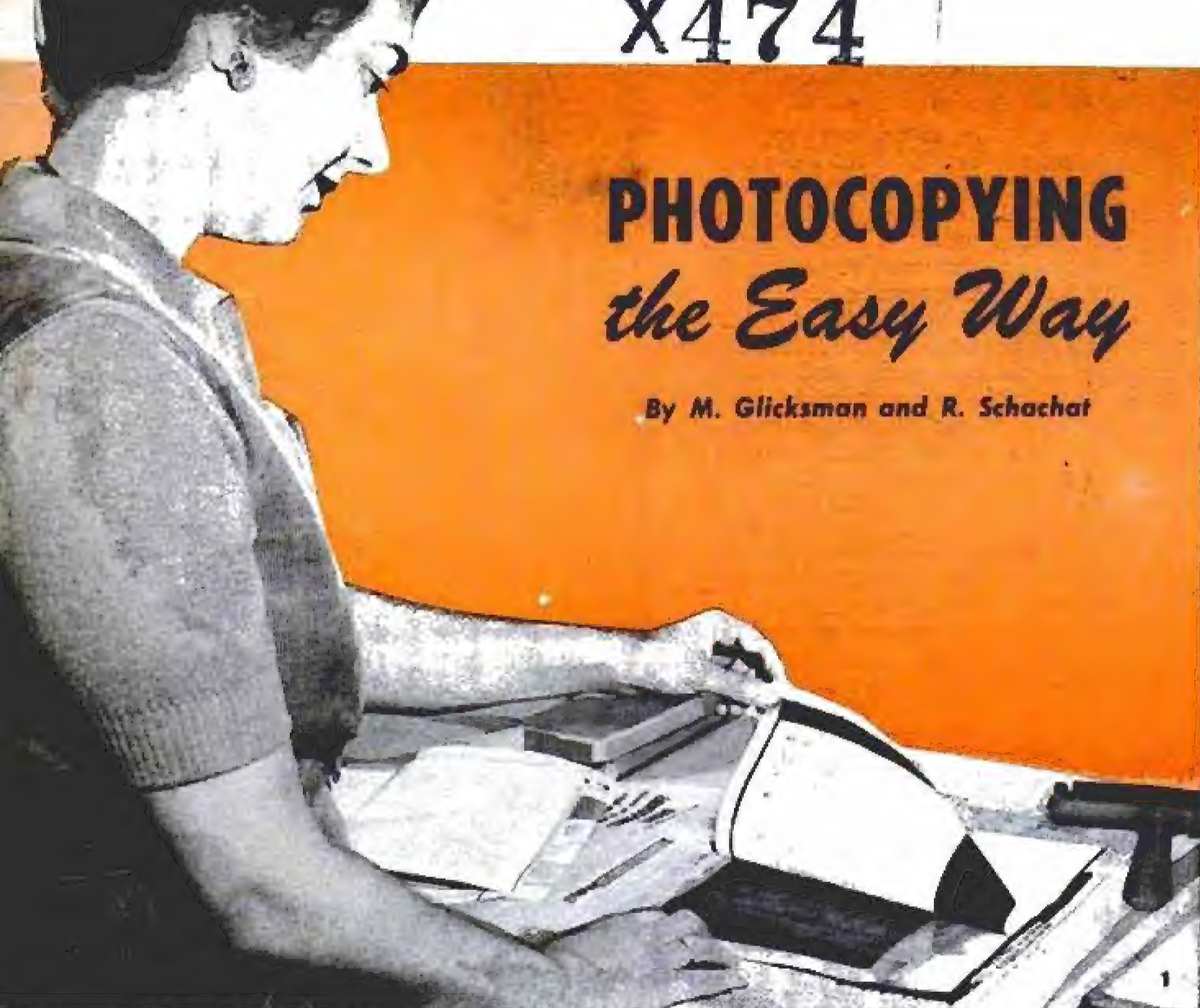
DUSTPROOF WALL CABINET

YOUR DELICATE china and other such treasured pieces of art glass, antique ceramics and porcelain will be protected from dust and damage when displayed in a wall cabinet with sliding glass doors, such as the one shown. This cabinet was made of mahogany lumber but any other suitable wood may be used following the construction details shown below. The top and bottom of the cabinet are identical, and assembly is with glue, screws and dowels. Note that screws alone fasten the bottom to the sides and back so that it can be removed to replace the glass doors, should they break. Two mending plates are screwed to back of the cabinet, spaced to permit hanging it on screws or nails driven into wall studs.—Hi Sibley, Nuevo, Calif.



PHOTOCOPYING *the Easy Way*

By M. Glicksman and R. Schachar



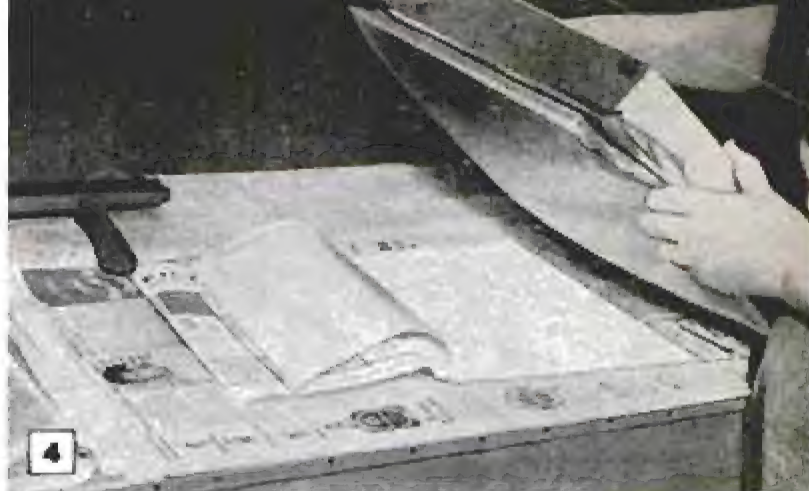
After thorough rolling of negative-positive "sandwich," image is transferred to the positive photocopy

Large-size print-exposure box consists of shallow metal box with six porcelain receptacles screwed to bottom and sheet of opal glass mounted on top



HERE IS A FAST, inexpensive method of making photocopies of important papers, business letters and other items, using a contact-printing box and photocopy paper and developer instead of a complicated camera setup or expensive photocopy equipment. The latter is suitable only for large-volume commercial operations. If you do not have a photographic print box that will take the standard $8\frac{1}{2} \times 11$ -in. sheet of typing paper, a suitable one can easily be made from plywood or light-gauge sheet metal, a sheet of opal glass and 6 to 10 porcelain light receptacles and an equal number of 15-watt lamps to be mounted inside. A switch is installed on one side to permit accurate control of exposures. Processing materials that you'll need include high-contrast photocopy negative paper, photocopy positive paper and suitable developer for these papers. The only darkroom equipment needed are developing trays, print tongs, rubber roller and a timer.

Exposing and processing of photocopy papers may be done in any room where



there is no strong light. The first step of the procedure is to place a sheet of positive paper emulsion-side down in a tray of developer and agitate it, Fig. 3. After the paper is thoroughly saturated, it is turned over and left in the tray until needed. Next, the item to be copied is placed on a flat surface and a sheet of negative paper is placed emulsion-side down on it, as in Fig. 4. If the material to be copied is printed on thin paper, it may be necessary to place a sheet of black paper under it to prevent printing on the reverse side from showing through. Then, the printing box is placed on top of the negative paper and an exposure of 10 to 20 seconds is made, depending upon the sensitivity of the paper used and intensity of light source, Fig. 5. After making a few trial exposures, you will be able to determine the correct exposure time for the materials and equipment used. Use test strips when making the trial exposures, and completely process them so they can be mounted on cardboard and the exposure time noted under each. This record may then be used as a reference for photocopying to be done at a later date.

The exposed sheet of negative paper is then placed emulsion-side up on a "pad" of newspapers and the positive paper is removed from the developer. After allowing the latter to drain for a few seconds, it is quickly placed emulsion-side down on the negative paper, with care taken not to drop water on it. Finally, the two sheets are heavily rolled 5 or 6 times to assure complete contact between them as in Fig. 6. After remaining in contact for about 45 sec., the negative and positive are peeled apart and the latter is dried emulsion-side up on the newspaper pad, Fig. 1. If the positive print shows no image, or one with little contrast, decrease the negative exposure time. Should the positive print turn out black, or with white areas that are too dark, increase the exposure time. To correct for a brown-tinted positive, increase the contact time of the negative-positive sandwich. Photocopies that are to be stored longer than a year, should be washed for 10 min. before drying. ★ ★ ★

Fig. 3. Positive photocopy paper must be well saturated with developer to assure good print. Fig. 4. Material to be copied is placed on flat surface to obtain complete image when negative is exposed on it



Above, pressure is applied to print-exposure box to keep all areas of slightly curved surface of book page in contact with it. Fig. 6. Pad of newspapers absorbs water rolled from negative-positive "sandwich"



Warped Plank Door Straightened by Installing X-Member



When doors that consist of a number of planks joined edge-to-edge vertically become warped diagonally, they can be pulled flat by installing an X-member of 1 x 2s. The first length of 1 x 2 is screwed across the diagonal that is flat, using a screw in each plank. Over this is fitted another length of 1 x 2 to form the X-shape. The latter member is screwed to the door planks, using one or two screws to each plank as necessary. Start driving the screws from the center of the brace outward, and retighten them several times.

George M. Glavosek, Columbus, Ohio.

Coal for Scale-Model Trains

Consisting of black, shiny grains, the grit used in sanders designed for automobiles is an ideal size and color for use as coal on a scale-model train layout. The grain size is good for either HO or O gauge, simply representing different grades of coal for each gauge. — Charles E. Cohn, Chicago.

Sources Other Than Ignition Cause Noises in Car Radio

Before installing additional suppression in the ignition system to remove noises in an auto radio, check other possible sources of interference. A high-pitched whine that varies with engine speed is caused by the generator. If the engine is cut off—radio on—at moderate speed, the whine will persist until the engine coasts to a stop. This condition is corrected by installing a by-pass capacitor between the armature terminal and a ground. (Do not connect it to the field terminal.) Noise caused by the voltage regulator is an irregular, rasping sound that is the result of arcing between the contacts. This sound will disappear below the charging cutout point of the regu-

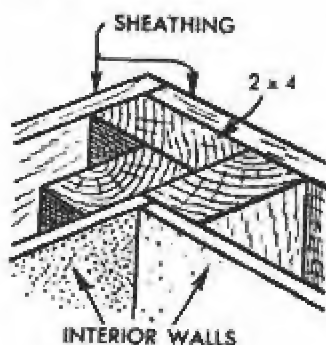
lator (when the red light goes on, or the ammeter shows no charge) and can be eliminated with a by-pass capacitor at the battery terminal on the regulator. Front-wheel noise occurs usually only in dry weather at speeds over 15 m.p.h. The irregular popping or "rushing" sound generally disappears when the brakes are lightly applied. Static collectors in the hubs or special graphite antistatic powder in the tires solve this problem. A hissing or crackling that occurs when bouncing disturbs the level in the gasoline tank is eliminated by a capacitor across the gasoline-gauge resistance element to a ground.

Champion Spark Plug Co.

Modified Corner Framing Saves Time and Lumber

Instead of framing the outside corner of a building or room in the conventional manner, with three 2 x 4s plus a 2 x 2 blocking, install the corner members as shown. This method saves time and lumber, and the resulting assembly provides a more rigid set of nailing surfaces than regular construction.

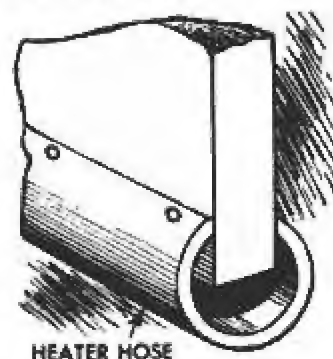
N. M. Pittman, Overton, Tex.



Garage-Door Weather Stripping Replaced With Heater Hose

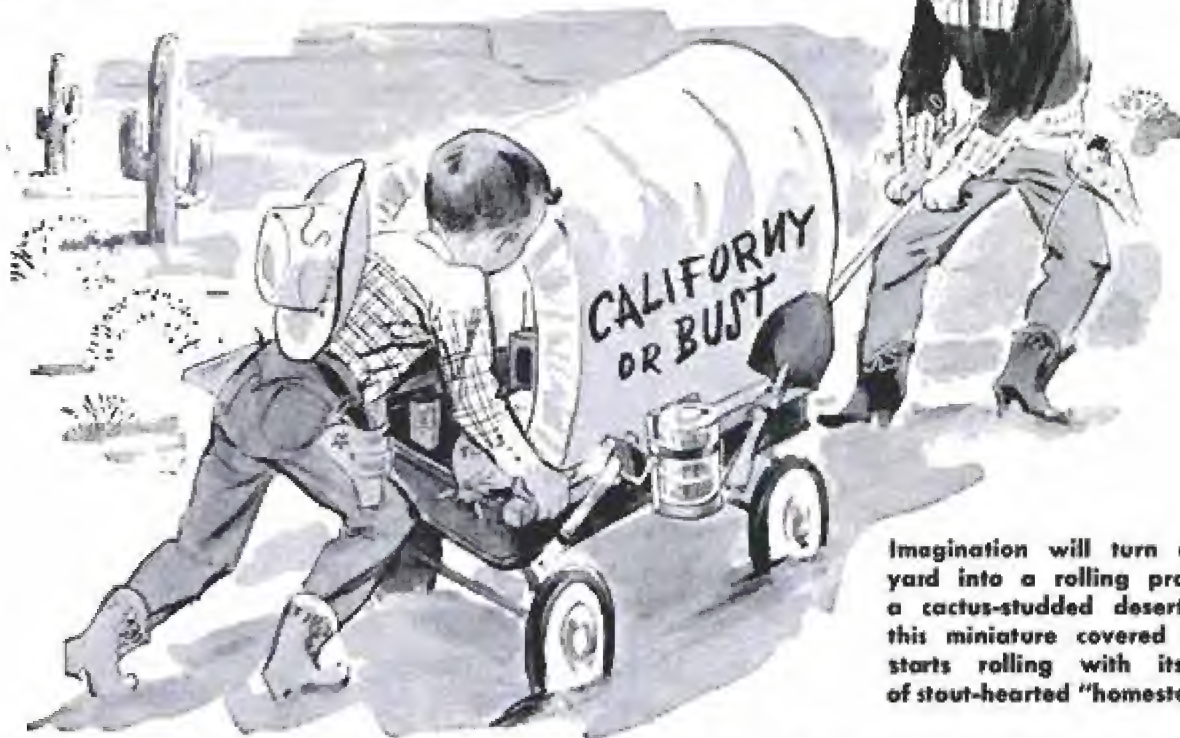
After twice replacing rubber weather stripping all along the bottom edge of his steel overhead garage door, one homeowner installed a longer-lasting, much less expensive weather seal. A length of auto-heater hose was slit lengthwise, fitted over the door edge and held in place with sheet-metal screws.

Herb Carrier, Detroit, Mich.



This Sidewalk Prairie Schooner

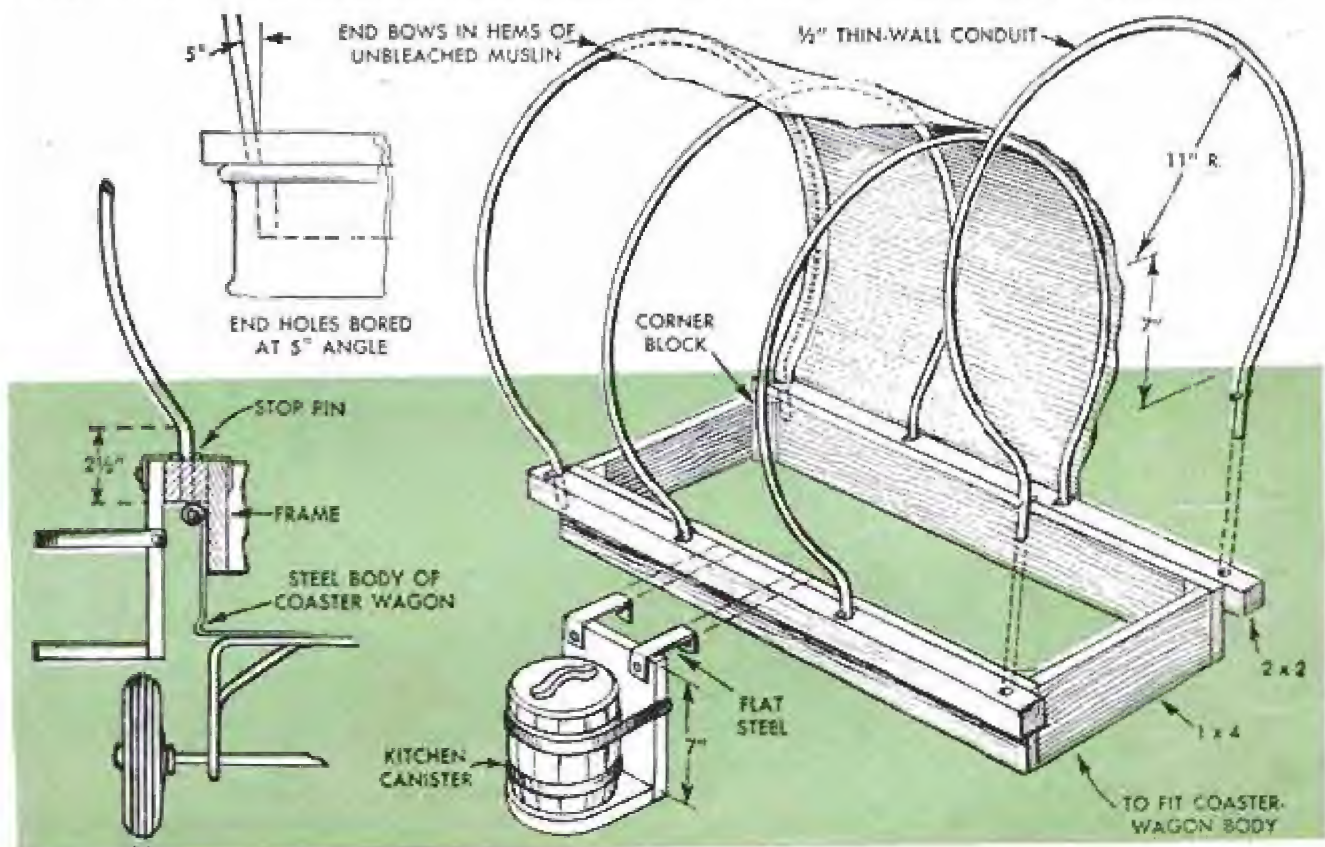
will add a touch of realism when your young "wagon master" heads his train west

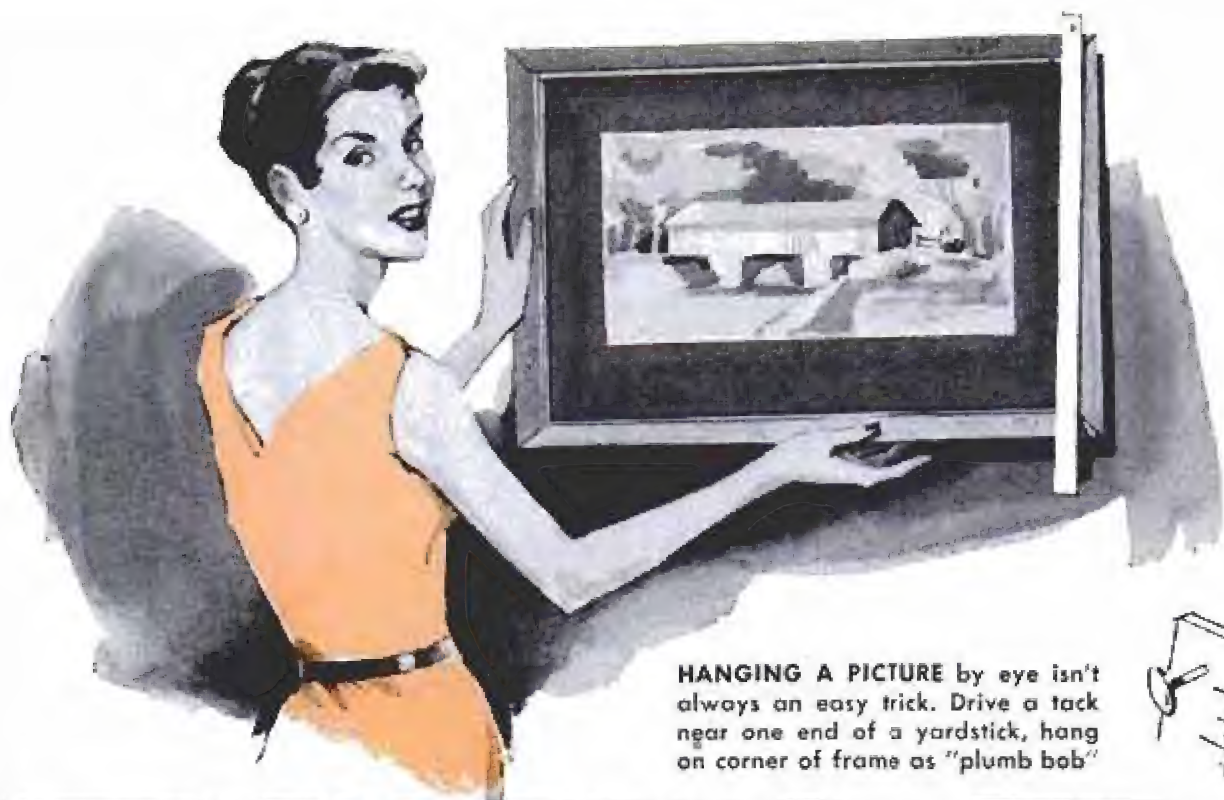


Imagination will turn a back yard into a rolling prairie or a cactus-studded desert when this miniature covered wagon starts rolling with its crew of stout-hearted "homesteaders"

BOSSING A STRING of Conestogas through Indian territory years ago was no easy job, but that two-gun cowboy of yours will enjoy it if you make this removable top for his wagon. A frame of 1 x 4s is cut and fitted to the inside of the wagon, and lengths of 2 x 2s are screwed to the long sides of the frame as shown. Holes bored

in the 2 x 2s accommodate the ends of bows bent from 1/2-in. thin-wall conduit to the dimensions given. Note that the end bows slant outward at 5 deg. Hems in the ends of the muslin covering should slip over the end bows. A kitchen canister, painted to resemble a water cask, is ideal for carrying lunches for trail-hungry wagon drivers.





HANGING A PICTURE by eye isn't always an easy trick. Drive a tack near one end of a yardstick, hang on corner of frame as "plumb bob"



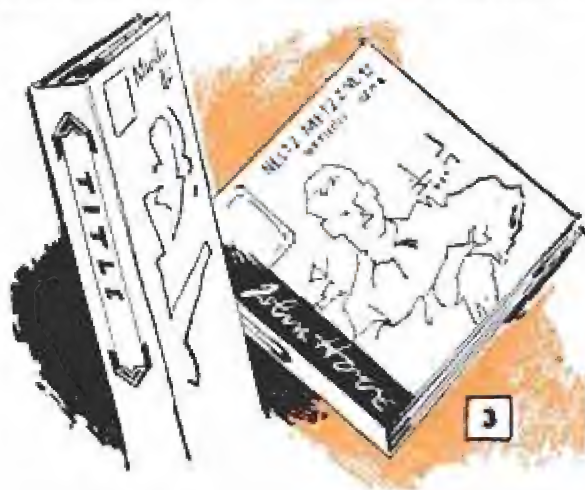
Solving **HOME PROBLEMS**



1



2



3

1. LENGTH OF ADHESIVE TAPE wrapped neatly around a doorknob enables you to turn it easily when your hand is wet. Use a crepe-back tape rather than the flat tape as the former can be pressed into full contact with the curved surface without wrinkling

2. RUBBER CANE TIPS or crutch tips slipped over ends of the back uprights of tubular kitchen chairs will eliminate any chance of a deep scratch on the wall. Note that a part of one side of each tip must be cut away to permit forcing it down over the tubing

3. PHOTO TABS, the kind you use in an album to hold the corners of prints, can be utilized to hold a list of record titles on backs of your record albums. Then if you change records in the albums at any time just insert new title lists under the photo tabs



4



5



6

4. NAILS, SCREWS, PICTURE HANGERS, TACKS—where are they? You can answer the question and solve the problem by sorting these essential household items and placing in a muffin tin, one lot to each compartment. Then you'll always know where they are

5. TAMPERPROOFING THE PLUG on an electric appliance or power-tool cord can be done by passing a $\frac{1}{8}$ -in. stovebolt through holes in prongs. Run two nuts on threaded end and draw tightly so that they lock. Prevents children from plugging in appliance or tool

6. FROZEN-FOOD CONTAINERS, made from metal foil, are handy for mixing small quantities of glue, patching plaster and paint. Small ones shaped like pie tins are best for liquids. They eliminate bother of cleaning containers after finishing the job



7

7. ORDINARY DOORSTOPS no longer look like doorstops when you use them as legs or leg extenders on that modern sofa you've been building. With the application pictured to go on, you'll think right away of other similar uses for projects in the planning stage

8. IF YOU'VE EVER TRIED to fold a dress pattern so it would go back in the envelope it came in, or keep it in order while in use, you can appreciate this tip. Clip separate sheets to a piece of cardboard and you'll always have the thing under control



8

Wire Hook for Paint Pail Has "Built In" Handhold



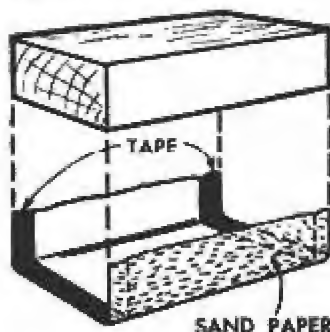
Because the lower loop is almost closed, this hook for hanging a paint pail from a ladder rung or eaves trough will not slip off the bail. A convenient "handle" eliminates the need for grasping the bail, which often becomes covered with paint. The hook is too long to fall into the paint when the pail is set on a surface.

Cost of Drill Set Reduced By Buying Alternate Sizes

If you are one of the many craftsmen who would like to own a full set of number drills from 0 to 60 but cannot afford their cost, here is one method of reducing the expense: Buy a half-set of drills, consisting of every other drill in sizes 1 to 59. Because the size difference between consecutive numbers is quite small, a drill one size larger than required will still provide enough metal for good threads when a hole is to be tapped. Alternate drills can be bought singly when needed.

Tape Reinforcement on Sandpaper Prevents Edges From Tearing

Tears forming in the edges of sandpaper held on a wooden block often make it necessary to discard the paper before the abrasive has worn down. To prevent the tears from forming, apply lengths of 1/2-in. masking or cellulose tape to the back surface of the paper, along the edges that cross the sanding block.



Sagging Garage Doors Repaired After Wedges Realign Them

Hinge-type garage doors that sag badly can be realigned by first driving a wedge under each one to force it back into the proper position. Hinge screws then are removed, the holes filled with wood putty and the screws reinstalled. A third hinge—if there are only two—is installed midway between the existing two for added strength. A diagonal brace now is screwed solidly to the inside surface of the door. A turnbuckle may be used instead, if future trouble is expected, to permit readjustment. Finally, the wedges are removed and the doors swung to check alignment of hinges and of latches or hasps and staples.

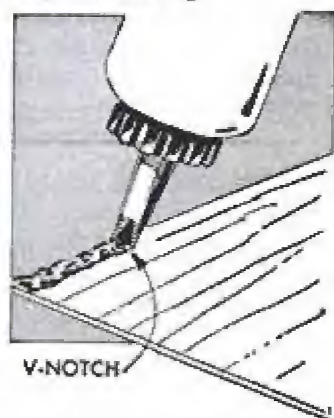
Consistency Check for Pouring Concrete Sidewalk

To guard against damage to a sidewalk resulting from application of ice-melting chemicals, such as salt or calcium chloride, be sure the concrete mix is the proper consistency when it is poured. If the mix is too thin, the thousands of tiny air bubbles that help the concrete resist the action of such chemicals, will be absent when it hardens. A good check on this is to fill a coffee can with the mix, tamp it with a pencil and then, overturn the container. When the can is removed, the concrete should hold its shape, yet be wet enough to have filled the form without leaving voids.

Nils E. Mockler, Putnam Valley, N. Y.

Notch in Adhesive Applicator Permits Accurate Spreading

When it is necessary to apply adhesive to the extreme edge of a piece of work, cut a V-notch in the spout of the cement applicator. One "leg" of the notch then is held on the edge of the work and the tube is moved along while the cement is applied — George F. Holden, Chesterfield, England.



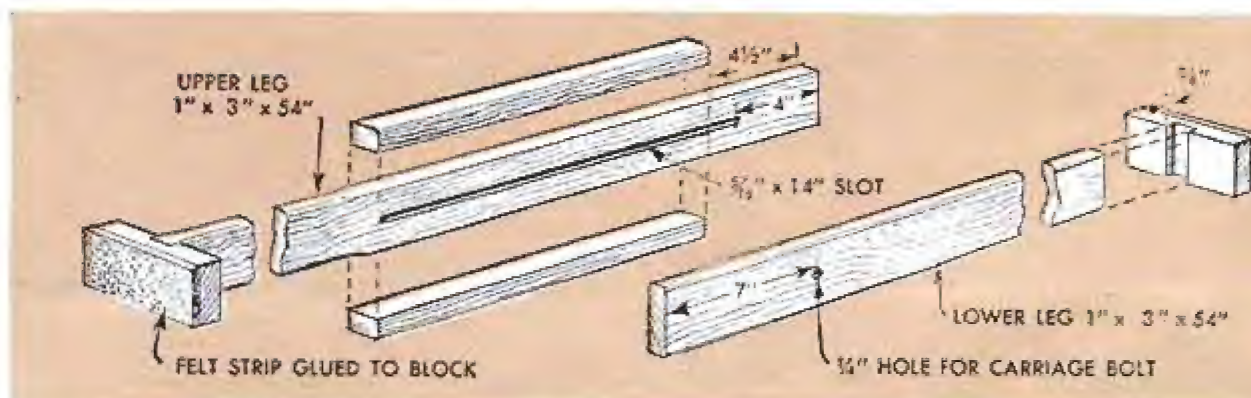


Photolight Standards

PROVIDING proper indoor lighting for most photographic situations in the home is easy and inexpensive when the required floodlights and spotlights are clamped to floor-to-ceiling standards, such as these. Since the standards are made of inexpensive soft-pine lumber in stock sizes, you can make several of them in an evening for less than half the cost of one manufactured light stand. Each standard consists of an upper and lower leg, both of which are cut from 1 x 3-in. stock and fitted with padded base blocks on the extreme ends as detailed in the drawing. Guide strips nailed to the sides of the upper leg prevent the standard from pivoting at the point of overlap, where the two halves are held in the desired extended position by a bolt and wing nut as indicated. When not in use, the legs are unbolted for compact storage.

P. L. Stotler, Nitro, W. Va.

Below, guide strips on upper leg prevent lower leg from pivoting at overlap point





X743

*You can grow
better fruit
if you learn*

HOW TO *Shape* TREES

By A. M. Wettach

Open space in a tree's foliage is filled and the crotch is reinforced by bending branch from side opposite opening and grafting it on trunk as shown

The vertical-growing branches on one side of young tree are pulled into proper positions with twine tied to ground stake and the base of large limb



WHETHER YOU HAVE a few fruit trees or a small orchard, it will pay to know the many corrective measures that can be employed to bring about and maintain yearly production of good quality fruit. To help you do this, growth correcting and grafting methods used by professional orchardists are explained in this article.

The ideal time for grafting and pruning is in the spring just before growth begins. Since a young tree usually grows many more branches than it requires for balanced growth, it is necessary to remove unneeded ones and cut back remaining ones. When doing this, make smooth slanting cuts close to the trunk or branch from which the growth is removed to permit fast healing and quick rain runoff. Branches and shoots that are shortened should be cut off just above a bud to force growth into it. A one-year-old whip or tree should be cut back to a height of 30 in. A branched tree two years and older should be cut back to a leader (main vertical branch) and a shortened shoot which normally becomes one of the side or scaffold branches and prevents formation of a weak crotch. If the tree has several branches, they are cut to various lengths at selected buds as in Fig. 10. This forces new growth into the direction the bud is pointed. At the second spring pruning, shoots on scaffold branches



Tree is reshaped by pulling outer branches into more horizontal position and tying them to stakes as required

are thinned to leave only the horizontal ones. Vertical branches are reduced to 18 in. in height and water sprouts (tender, green growth) are removed. Pruning for the third to fifth years is similar to the second year, except that additional scaffold limbs are selected and the older ones are shaped to leave a leader on each.

Arrows indicate points at which scion was bridge grafted to span damaged area of badly girdled tree trunk. Board shades new graft from direct rays of sun

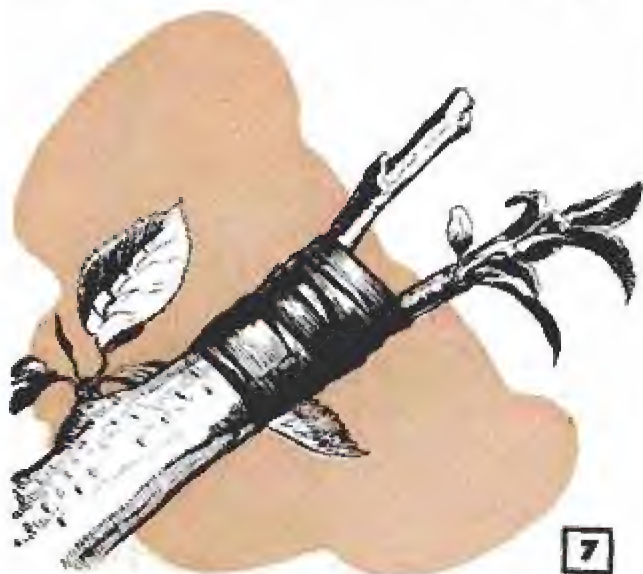
When proper or desired tree growth can't be obtained by pruning, scions (new wood, either terminal growth of branches, or sprouts of about $\frac{1}{4}$ in. diameter and with two to six buds on each) may be grafted to the tree to provide additional growth where needed. Grafting may be done by means of one of the following

Two underdeveloped fruit trees are combined to form one strong one by planting one next to other and grafting them together at point indicated by arrow



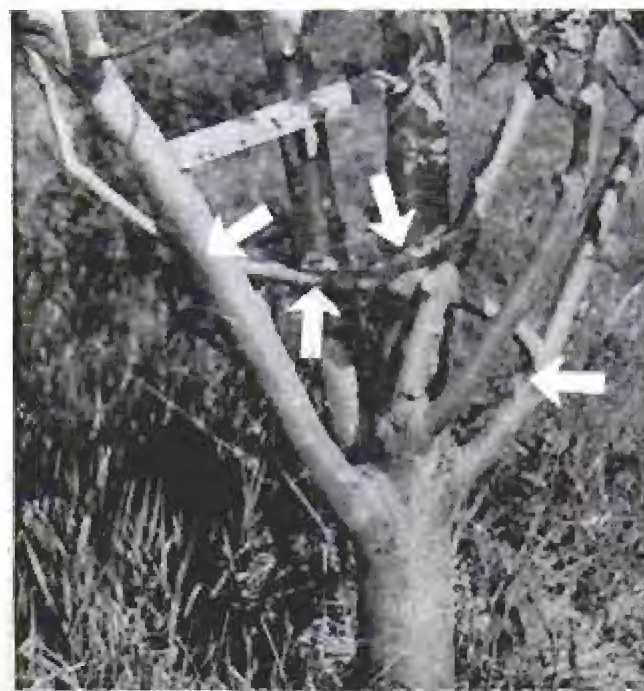


Above, to prevent tree crotch from splitting, water sprouts growing on right branch have been grafted to trunk. This work must be done when tree is young



Above, scion of desired fruit tree variety is shown grafted to top-worked branch of less desirable one

Below, small branch from limb on right side of tree is bent and bridge grafted to trunk and other limbs



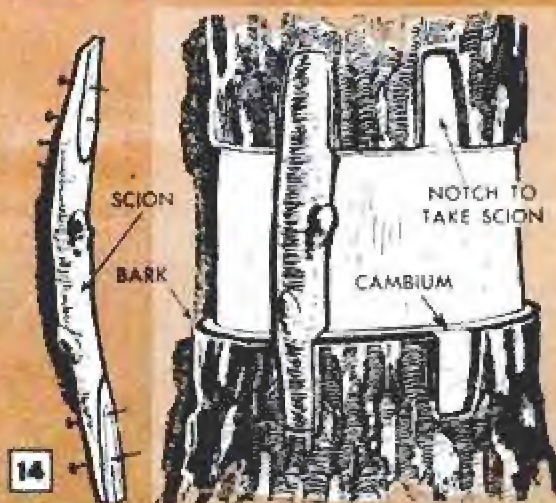
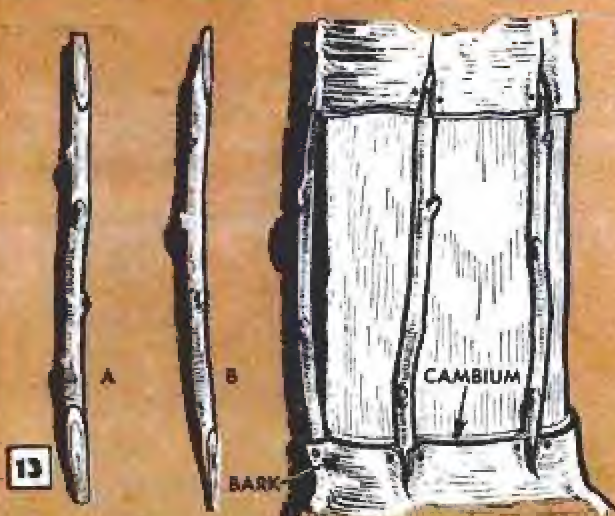
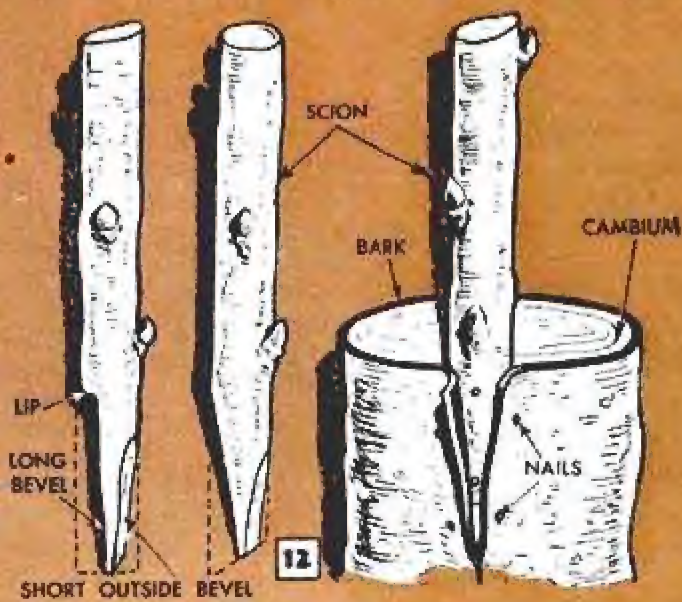
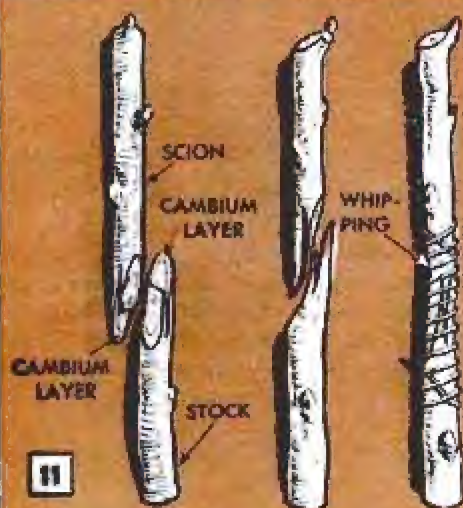
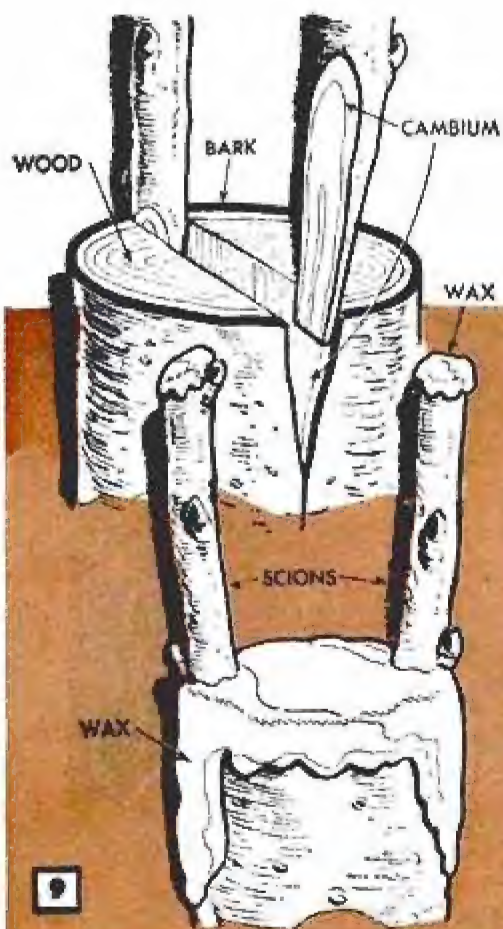
types of joint: whip graft, Fig. 11; cleft graft, Fig. 9; bark graft, Fig. 12, and bridge graft, Figs. 13 and 14. Scions used for this purpose must be cut in winter or early spring from a hardy variety of fruit tree and stored in a cool damp place until used. Scions may also be obtained from most nurseries. A scion that is to produce fruit must be cut from terminal growth, one used for strengthening a crotch, Figs. 6 and 8, or for repairing a damaged trunk, Figs. 4, 13 and 14 may be cut from nonfruiting wood, such as water sprouts. When reinforcing a crotch, a water sprout or small branch found growing on one of the branches is cut back so that its tip can be inserted in a slit cut in the bark of the trunk as indicated in Fig. 6, using the bark-graft method as in Fig. 12. Several crotches on a tree may be strengthened with the same sprout, by bending it to cross several branches and grafting it to them as in Fig. 8. This is done by baring the cambium on the sprout and branch at each contact and binding the sprout in place as in Fig. 1.

Whip grafting may be used for providing additional branches where scanty growth exists, for joining two water sprouts to make a natural brace and for top-working a tree to change the variety of fruit produced by it. This graft is made by joining the scion with the stock (branch to which scion is grafted) as detailed in Fig. 11. When a scion is grafted to stock that is somewhat larger in diameter than itself, the cleft graft is used, Figs. 7 and 9. For stock that is considerably larger than the scion, the bark-graft method is used as in Fig. 12.

Bridge grafting is a method of reuniting the cambium layer on the sides of a tree trunk that has been badly girdled. Figs. 13 and 14 show two ways of doing this. A tree that has insufficient vigor or yielding ability can be improved by planting a young tree next to it and grafting the two trunks together to give it two root systems as in Fig. 5. The cambium layers of the trunks are first exposed at the point of contact and then nailed together. After the trees have grown together, most of the transplanted one's branches are removed.

For successful grafting, it is important that the cambium layer of each member of a joint be in firm contact with the other. Buds on grafted material should point outward so branches that grow from them will be properly placed. All graft joints should be given an airtight covering, such as wax or rubber tape to prevent sap loss.

Fruit-tree branches that grow in a vertical direction can be made to grow laterally by tying them to stakes as in Figs. 2 and 3. This permits sunlight to enter, resulting in more colorful fruit. ★ ★ ★





SHOOTING TIPS

By Bob Berger

IF YOU PARTICIPATE in the fascinating sport of target shooting with a .22 caliber pistol or rifle, one of the following tips may help to solve a problem for you. Shooters who wear glasses sometimes have trouble when using telescopic or iron sights. A strip of black tape, in which a small hole is punched, can be fitted over the lens on the shooting eye. When aligned with the pupil, the hole usually will show the target clearly. A new pistol will not be so likely to rust if given a thin coat of paste wax and buffed to a high polish; it looks well, too. Instead of digging into your pockets or in cartridge boxes, sew belt loops to a tobacco pouch and carry it full of cartridges at your waist. Light glare in your "scope" will be no problem when a sunshade, consisting of a cardboard tube, blackened inside and out, is fitted over the end.



Above, left, tape with hole in it on one lens of eyeglasses sharpens target seen through telescopic sight. Above, pistol is rustproofed, blued finish protected, with coating of paste wax. Below, left, loops sewed to inexpensive tobacco pouch convert it to handy belt-carried cartridge case. Below, cardboard tube, blackened with India ink, is fitted over telescopic sight as effective glare-stopping sunshade



Scale Easier to Read When Coated With Black Crayon



For easier reading of the scale etched or molded on the side of a graduate, fill in the lines and numbers with a black marking crayon, such as used in stores for marking china and glass merchandise. Then, wipe the excess crayon from the unmarked glass and apply one or two coats of clear lacquer on the scale area.

John J. Rea, Urbana, Ill.

Bulk Developer Sealed In Convenient Packets



If you use powdered photo developer that is available only in cans or packages containing more material than is needed for one mix, the remaining dry chemicals of the two-part formula can be sealed in compartmented waterproof envelopes for future use. An envelope is made by folding in half equal-sized squares of plain paper and mounting tissue, keeping the tissue on the inside. Seal two edges of the paper and tissue with a warm iron to form an open-end envelope. Next, pour in the correct amount of the developer for one mix and seal the envelope across the middle as in the photo. Then add the second part of the formula and seal the top.

SEPTEMBER 1958

Tape Ends of Exposed Roll Film To Prevent Light Streaks



Light streaks on the edges of roll film, caused by the film winding to one side on the takeup spool, can be prevented by wrapping the ends of the exposed roll of film with masking tape as shown in the photo above. Turn the ends of the tape back on itself about $\frac{1}{2}$ in. to provide a tab for easy removal in the darkroom.

Ben Perry, Ketchikan, Alaska.

Additional Lens Taped on Camera Permits Taking Closeup Shots



To take closeup shots with an inexpensive camera, tape the lens from a spare camera on the lens of the camera used as shown in the photo. The second lens must be about the same diameter but not necessarily of the same focal length as the one on the camera used. If your camera doesn't have a focusing back, it will be necessary to determine the new focusing distances before loading it. To do this, tape a square of ground glass or tracing paper to the open back of the camera and focus on an object for each of the close-up distances to be used. Mark the new scale on a strip of tape applied over the existing scale.

Ken Murray, Colon, Mich.



REPAIR TIPS YOU SHOULD KNOW

By Enno R. Haan

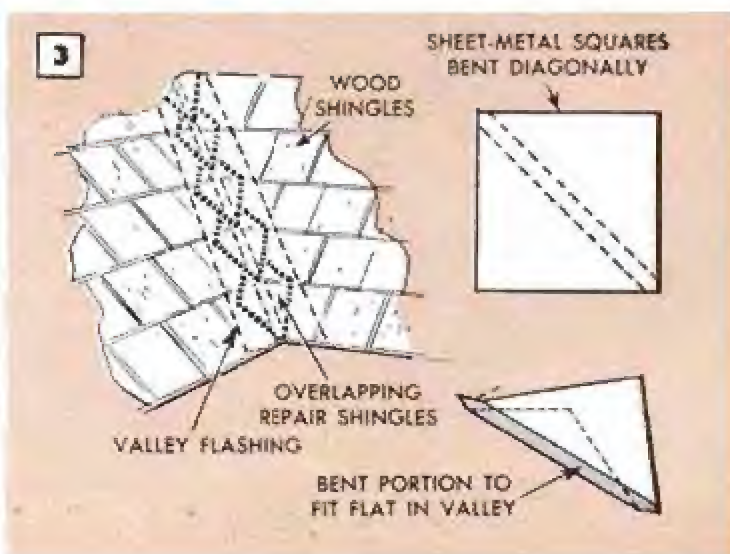
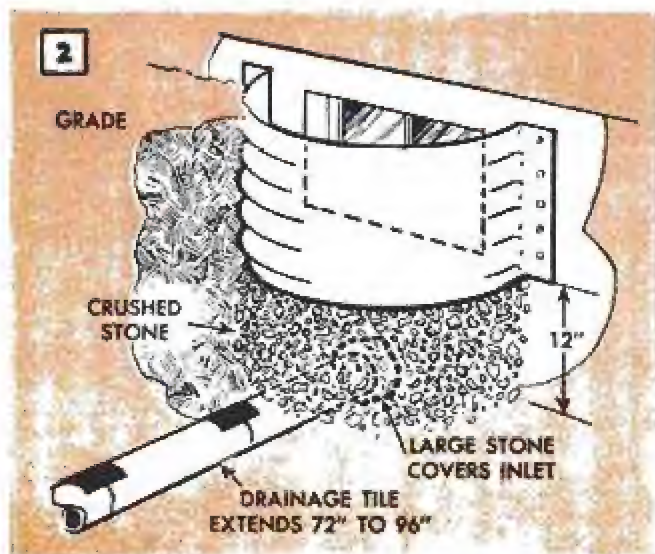
MANY PROBLEMS arise daily around the home to test the skill and ingenuity of the do-it-yourselfer, especially when "tricks of the trade" that make the job easier, are unknown to him. Illustrated in this article, are suggestions on how to handle some of these problems.

It is hard to start and maintain a good stand of grass on a steep bank between lawn levels. A gradual slope will eliminate this difficulty but, if this is not desired, as when the level effect of a foundation planting is to be maintained, use a simple retaining wall of flagstones, Fig. 1. This

provides a pleasing accent, yet serves to retain the sharp incline. Lay the stones loosely without bedding them in cement.

If rainwater collects in a window well and runs into the basement, provide a drainage area of crushed stone and open joint drainage tile immediately under the well retainer to absorb the water as shown in Fig. 2. A flat stone should be placed against the end of the tile in the well area to prevent the crushed stone from filling it.

To repair leaks in valley flashing of a cedar-shingled roof, bend sheet-metal squares of the required size to a diagonal

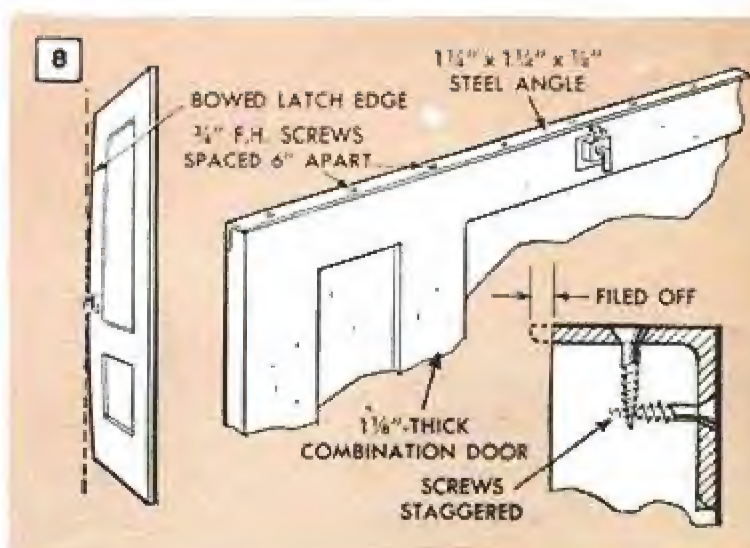
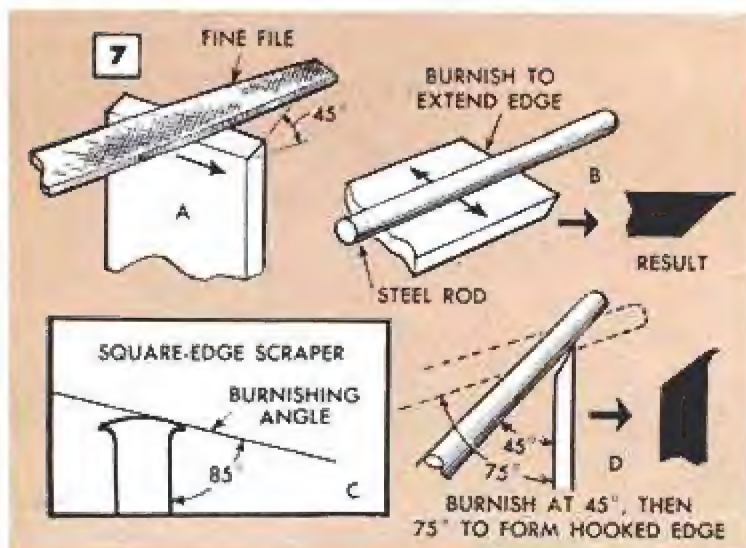


shape and tap them upward under the butt ends of the shingles so they extend about 3 in. or more under the next course as in Fig. 3. No nails should be used to hold the repair shingles in place.

An annoying creak in a hardwood floor may be fixed by carefully locating the spot where creaking occurs and drilling a tiny pilot hole through the floor to take a spirally fluted flooring nail, Fig. 4. Drive the nail well into the subfloor, setting the head slightly below the floor surface for filling with wood putty later. You may need to drive several nails in this manner to stop a large area from squeaking. For more effective and easier insecticide spraying of the underside of foliage, use a power-operated sprayer, or couple the spray attachment of your vacuum cleaner to a hand sprayer as in Fig. 5, if your vacuum is so equipped. Basswood roll shades on a screened porch can be kept from blowing inward by tying two retaining cords to screw eyes turned in the upper and lower crossrails of each screen as indicated in Fig. 6. There should be enough slack in the cords for lowering and raising the shades.

Since the cutting edges of paint-scraper blades are slightly hooked for efficient cutting, they can't be properly sharpened by filing or grinding. The correct procedure is shown in Fig. 7. After squaring the cutting edge with a file, a 45-deg. bevel is filed on it, detail A. Then, the edge is extended by rolling it with a steel rod, after which it is burnished—first, at a 45-deg. angle and then at a 75-deg. angle to form the hooked edge. For a square-edge scraper, both sides of the edge are burnished at an 85-deg. angle as in detail C.

A wooden combination door that is bowed along the latch edge can be permanently straightened by screwing a steel angle to the edge as in Fig. 8. For proper closing clearance, saw or plane $\frac{1}{8}$ in. off the door width to take the angle. ★ ★ ★



Scratchproof Work Surface for Cutting Aluminum Sheet Metal



To protect the surfaces of aluminum sheet metal from becoming scratched when cutting it, one home craftsman nailed a short length of corrugated galvanized roofing on one end of his bench top as shown. Steel shavings and abrasive particles from other work fall to the bottom of the corrugations, leaving only clean ridges to come in contact with the soft aluminum.

G. E. Hendrickson, Argyle, Wis.

Wetting Agent Added to Water Aids Removal of Wallpaper

Wallpaper can be removed quickly and with little effort when a commercial wetting agent or a detergent is mixed with the water used for soaking it. This additive permits the water to penetrate the paper more readily to dissolve the adhesive. About 1 teaspoon of wetting agent per gal. of warm water is sufficient. Apply the solution with a sponge and let it soak a few minutes before removing the paper. Wet the paper a second time, if necessary.

J. B. Mullen, Barrington, Ill.

Backflushing With Solution Stops Leak in Heating System

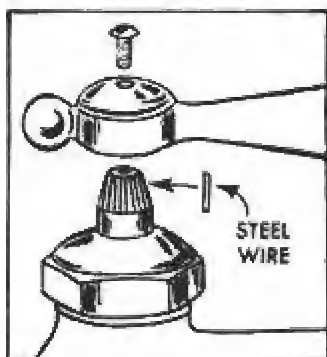
If it becomes necessary to use a preparation to stop a leak in a hot-water heating system, the preparation may be applied without draining the system by backflushing. Normally, the entire system down to the boiler level has to be drained before applying the preparation, a 4 to 5-hr. job. To do the job by the backflushing method, simply mix a solution of preparation and water and pour it into a length of garden hose with female fittings on both ends, after having fitted a cork in one end. Next, remove the cork and turn the hose fitting on the drain cock at the base of the boiler water jacket. If the hose is tightly clamped with a C-clamp, or collapsed by other

means, very little of the solution will be lost when doing this. Then, screw the other end of the hose to the nearest threaded water tap, turn on the water and open the drain cock on the boiler. The water pressure will force the solution out of the hose and into the heating system. As the solution passes through the crack in the pipe, radiator or boiler, particles are deposited on the sides of it until the opening is filled and the leak is stopped. After disconnecting the hose, the excess water in the system merely passes out the overflow pipe. If one preparation doesn't completely stop the leak, apply a second one in the same manner.—Henry K. Fitts, Winchester, Mass.

Tighten Water-Tap Handle

For temporary repair of a water-tap handle that slips on the splined stem to which it is attached, insert a short length of fine steel wire in one of the grooves of the spline as indicated in the detail. Of course, it is necessary to remove and replace the handle to do this.

C. H. Hardy, Whittier, Calif.

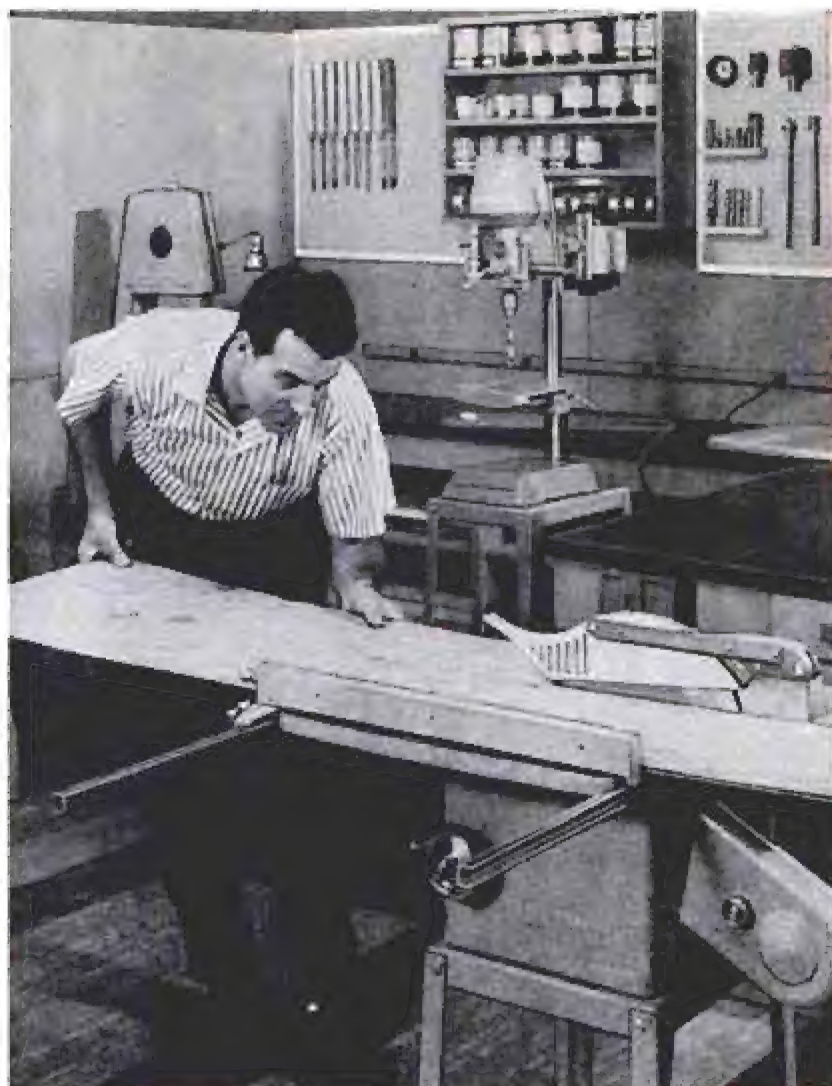


Remove Cork With Nail

When a corkscrew is needed for opening a bottle and you have none, try using a nail to remove the cork in the manner shown in the detail. Be sure to push the nail through most of the cork at the

angle shown before twisting to prevent breaking off the upper part.—Deoshankar Ajodah, Curepipe, Mauritius.





POPULAR MECHANICS

SHOWCASE OF TOOLS



This is the first of a series of articles to aid readers in determining sizes and types of tools best suited to their needs. Tools shown are intended to give readers a "showcase" view of various units available in workshop sizes. Picturing tools in this series does not constitute approval or disapproval of them by *Popular Mechanics*.

CIRCULAR SAWS

By E. R. Haan

TO MANY home-shop owners, purchase of a power tool represents a sizeable sum they will invest perhaps only once in a lifetime. For this reason the size, type and quality of tools purchased should be carefully considered beforehand.

Feeling that many readers interested in power tools do not have an opportunity of viewing all workshop power units available, such as circular saws in the bench and floor types, portable electric handsaws, drill presses, portable electric drills, etc., *Popular Mechanics* will, from time to time, present a cross section of these tools in the various groups.

If you're considering purchase of your first power unit, such as a circular saw for example, or adding to your present shop equipment, a look at all the tools in that group in which you are interested not only can save you money, but can assure that you get the right tool for your purpose. In suiting the tool to the work there are several basic factors to think about, such as its work capacity, the shop space it will occupy and the range of operations that can be performed on it with and without accessories.

You will require only a few accessories for a circular saw to do a wide range of work. The combination blade, Fig. 12, will do crosscutting, ripping, beveling



Bench saws usually are best suited to shops where space is limited



Wide range of accessories is available for all types of table saws



1

TILTING-ARBOR BENCH SAW takes 6½-in. blade, cuts full 2 in. deep. Takes a 5½-in. dado head. Table measures 12 x 13 in. without extensions, is made from steel plate ground smooth on top surface. Rip fence is double-locking type. Handwheel adjusts blade for tilt angle, depth of cut. Requires ½-hp., 1750 r.p.m. motor for average work, ½ hp. for heavy duty
Rocco Products, Inc., 2916-4th Avenue S., Minneapolis, Minn.



2

BENCH SAW makes cut 3-3/16 in. deep with a 10-in. blade. Tilting arbor is mounted on ball bearings. Table is cast iron, 15 x 19¼ in., and base is made from heavy sheet metal. Rip fence locks front and rear. Lever adjusts depth of cut, locks automatically. Handwheel controls degree of tilt for angle cuts. Requires ¾-hp., 1750 r.p.m. motor for average work
American Machine & Tool Co., Inc., Royersford 1, Pa.



3

8-IN. TILTING-ARBOR SAW, above, cuts to 2¾-in. depth. Table size is 13 x 17 in. without extensions. Lever locks fence at ends. Has floating mount for ½-hp., 3450 r.p.m. motor. Handwheel controls tilt, depth
Duro Metal Products Co., 2649 N. Kildare Ave., Chicago 39



4

9-IN. TILTING-ARBOR SAW, above, comes with a 16 x 24-in. table, is regularly supplied with stand. Cuts 2¾ in. deep with 9-in. blade. Handwheel controls depth and tilt. Requires ¾-hp., 3450 r.p.m. motor
Magna Power Tool Corp., Menlo Park, Calif.

10-IN. TILTING-ARBOR SAW, below, is designed for heavy duty. Cuts 3½ in. deep, requires ¾-hp., 3450 r.p.m. motor. Table is 20 x 27 in. without extensions. Fence has fine adjustment, locks at both ends
Montgomery Ward & Co., 618 W. Chicago Ave., Chicago 10

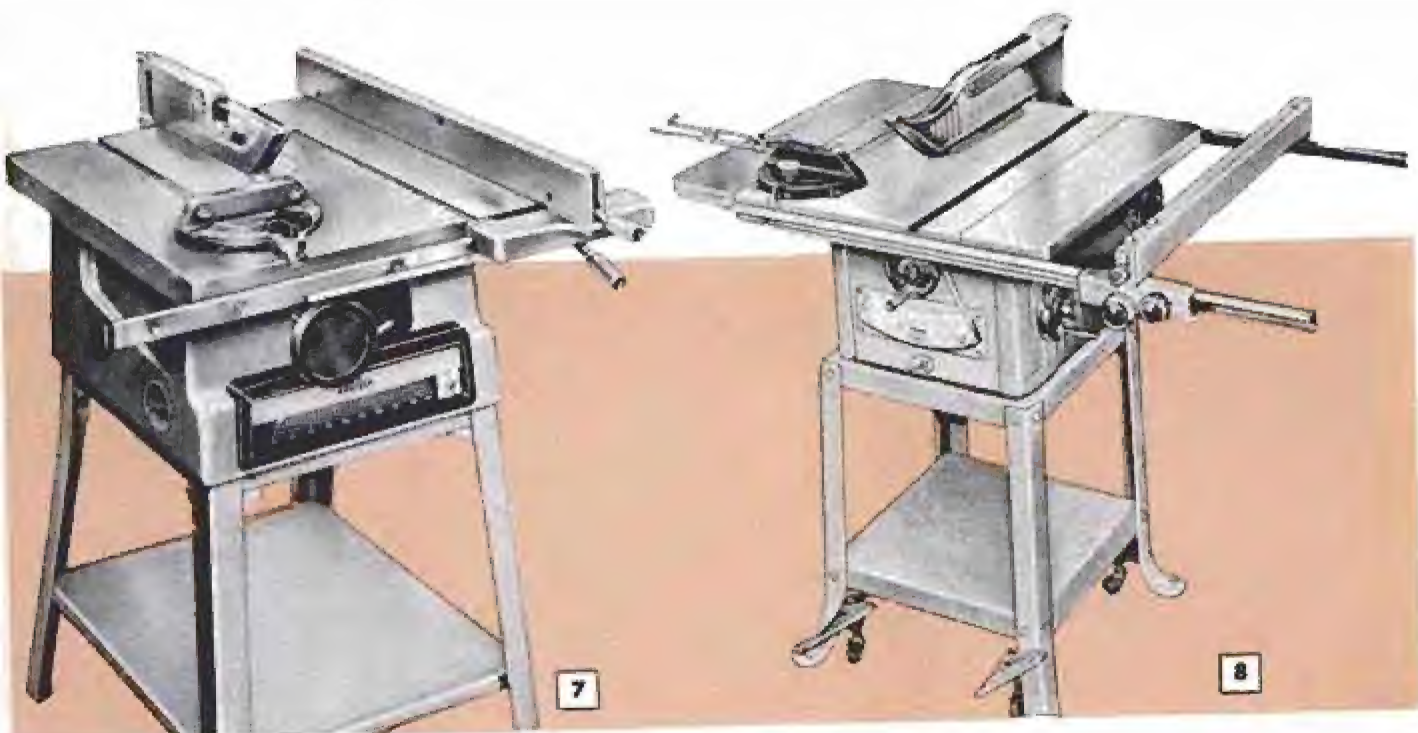
8-IN. TILTING-ARBOR SAW, 4-IN. JOINTER, below, come as a combination unit mounted on floor stand and operated by ½-hp., 1750 r.p.m. motor. Jointer bolts to table. Jigsaw attachment is also available
Sears, Roebuck & Co., 925 S. Homan Ave., Chicago 7



5



6

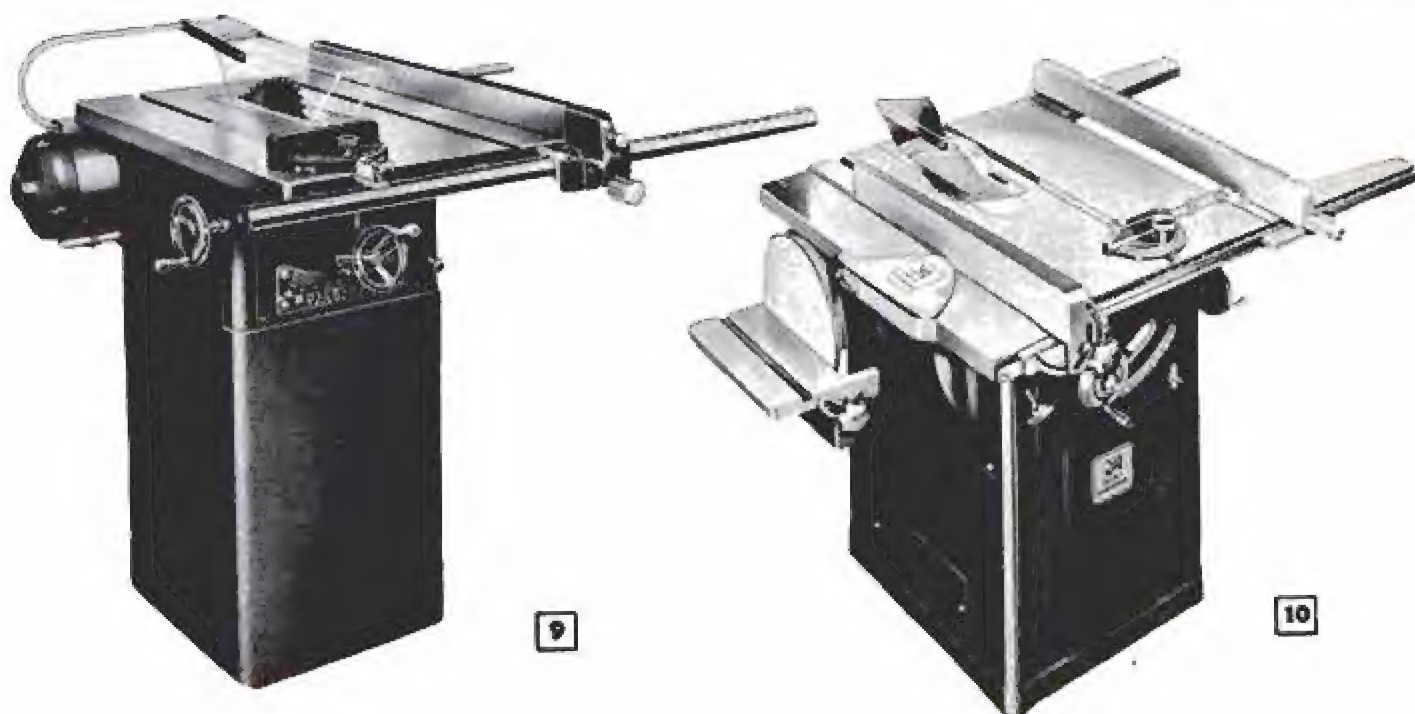


8-IN. TILTING-ARBOR SAW comes with or without steel floor stand. Maximum depth of cut is 2½ in. Machine features a one-piece steel base. Cast-iron table is 17 x 22½ in. without extensions and top surface is ground smooth. Lever at front locks both ends of ripping fence simultaneously. Dual-control handwheel adjusts blade for depth of cut, tilt angle. Requires ½-hp., 3450 r.p.m. motor; ¾ hp. for heavy duty

Atlas Press Co., 1015 N. Pitcher St., Kalamazoo, Mich.

9-IN. TILTING-ARBOR SAW also comes with or without steel stand. Latter can be fitted with treadle-operated casters as pictured. Table measures 22 x 25 in. with extensions, is made from smoothly finished cast iron. Base and stand are of steel. Blade cuts 2½ in. deep. This unit has two controlling handwheels. Wheel at front of base raises and lowers arbor; handwheel at side of base controls the tilt angle. Requires ¾-hp., 3450 r.p.m. motor for average work

Delta Power Tool Div., Rockwell Mfg. Co., 502E N. Lexington Ave., Pittsburgh 8, Pa.

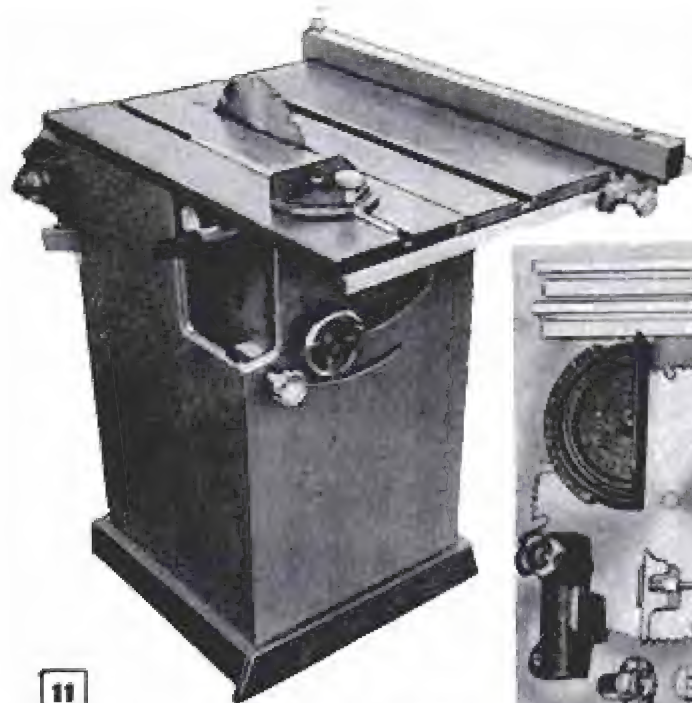


10-IN. TILTING-ARBOR BENCH SAW is available with an enclosed-type floor stand as pictured. This is a somewhat heavier machine than those preceding. Has a 20 x 27½-in. cast-iron table, smoothly finished, 36 in. wide with extensions. Rip fence also is cast iron, finished on both sides. Locks at the front. Blade cut 3-1/16 in. deep. Has separate handwheel controls for depth and tilt. Requires 1-hp., 1750 r.p.m. motor

Hoice-Crane Co., 930 W. Central Ave., Toledo 6, Ohio

THIS COMBINATION UNIT is a true floor-type machine, has no subbase as do all bench saws. Combines an 8-in. circular saw, a 4-in. jointer and a 10-in. disk sander, all three units being driven by one motor housed in the base. Has separate handwheels for controlling depth and tilt angle. Pivoted yoke controlled by depth handwheel permits swinging saw blade or jointer alternately into working position

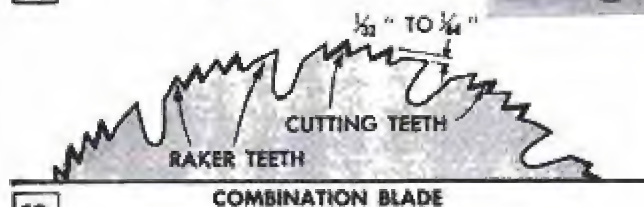
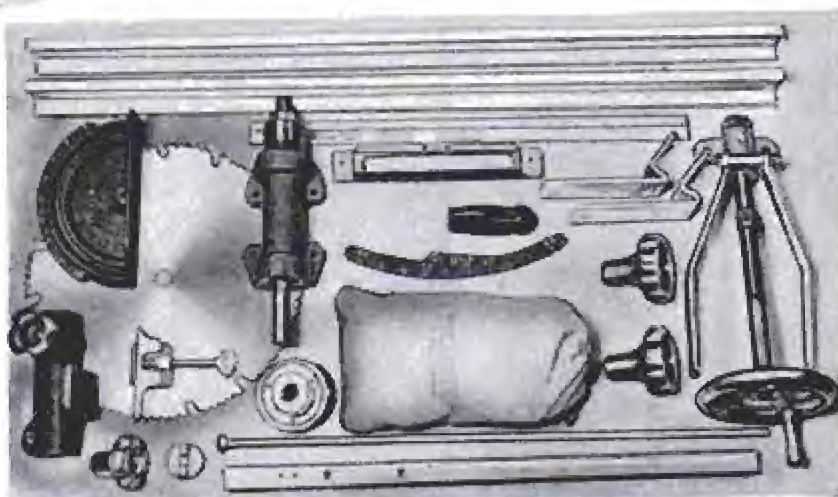
Yates-American Machine Co., 701 4th St., Beloit, Wis.



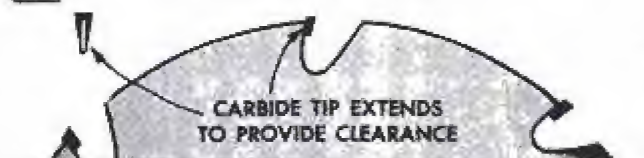
11

10-IN. TILTING ARBOR SAW comes to you as a kit with complete instructions. You make the floor stand and table, using hardwood and plywood and the kit which includes all necessary parts of steel and cast iron, to make complete unit pictured, less motor. Cuts $3\frac{1}{4}$ in. deep. Has separate controls for depth, tilt

Gilham Power Tools, Lambert Field, St. Louis 21, Mo.



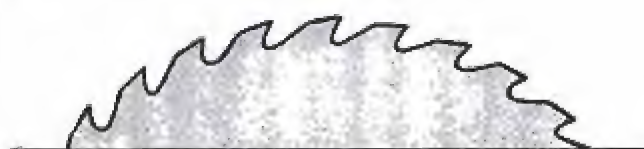
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13



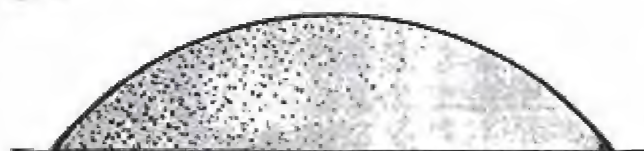
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16



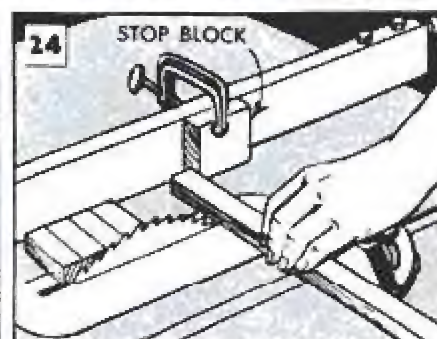
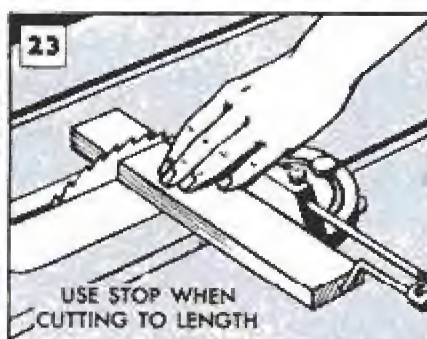
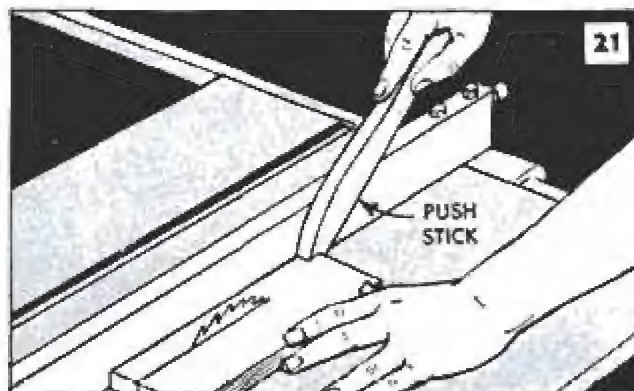
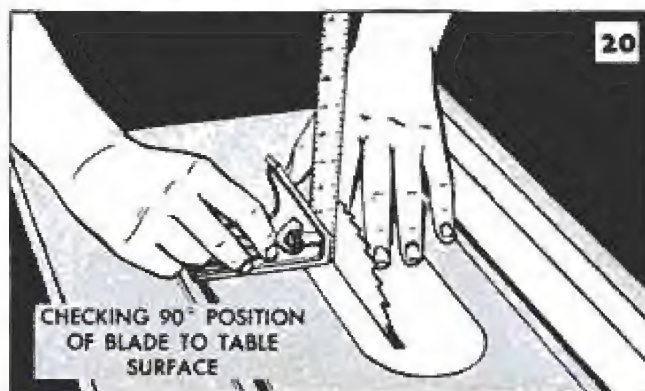
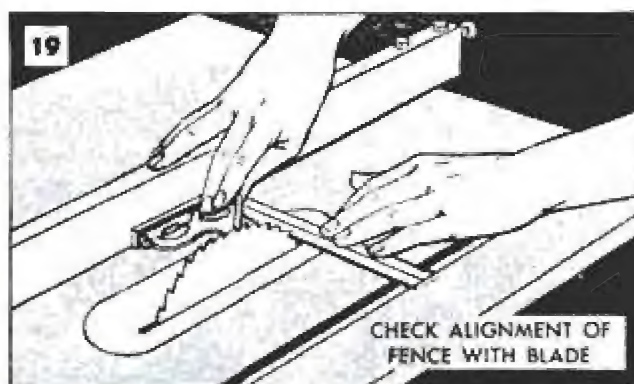
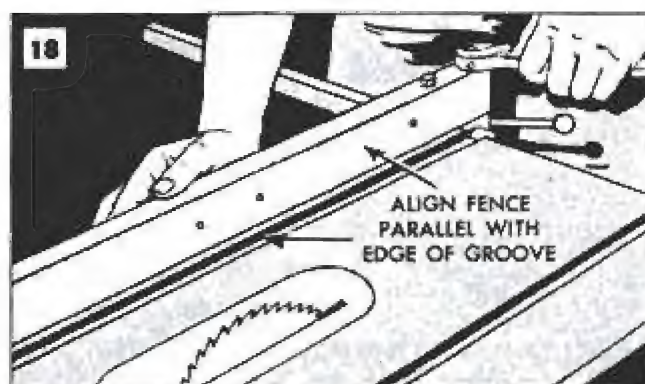
17

and mitering. You also can cut rabbets of almost any size required by making two passes of the stock. Grooves can be made with the saw blade by running adjacent cuts to give the width required. The circular blades detailed in Figs. 13, 14 and 15 are more or less classed as special-purpose blades.

Dado cutters, Fig. 16, consist of two outside cutters, or saws, and three or more inside cutters, or chippers. In the regular size the outside and inside cutters and the chippers are 6 in. in diameter, although smaller and larger sizes are available. The outside cutters can be used on the saw arbor individually, as a pair, or in combination with the chippers to cut grooves varying in width from $\frac{1}{8}$ to $1\frac{3}{16}$ in., the widths rising from $\frac{1}{8}$ in. by 16ths. The maximum depth of cut on the average saw table is about 1 in.

Abrasive wheels, Fig. 17, of the common types made for use on the saw arbor will cut nearly all metals but will not cut wood. Another type consists of a steel disk to which grains of tungsten carbide are bonded, a coarse grade on one side and a fine grade on the other. This wheel will cut either wood or metal. Wheels of both types are used to cut through materials and also as abrasive disks (the rigid wheels) for squaring ends of material.

Straight moldings of many different shapes and sectional sizes can be run on a table saw by using a three-knife molding head on the arbor. Only the head with several standard sets of knives, or cutters, and a special table insert are necessary to convert your saw into an efficient straight shaper. The ripping fence and miter gauge with which every table saw comes equipped serve as guides.



Figs. 1 to 11 inclusive picture table saws of both the bench and floor types and the specifications give you a general idea of the capacity of each unit, the construction and the size motor required for average work. Craftsmen and nearly all manufacturers refer to a table saw as a "6-in. tilting-arbor saw" or a "10-in. tilting-arbor saw", meaning that the machine comes equipped with a 6 or 10-in.-diam. blade. Thus the blade size determines to some extent the table size, the weight and general construction of the machine. Of course, the 10-in. saw will take a 6-in. blade but the maximum depth of cut will be reduced. For example, if the 10-in. blade with which the machine comes equipped gives a maximum depth of cut of, say, $3\frac{1}{4}$ in. then the maximum cut of the 6-in. blade on the same arbor would be about $1\frac{1}{4}$ in.

All the various makes of saw tables pictured in Figs. 1 to 9 inclusive are bench type machines. Only those shown in Figs. 10 and 11 are true floor-type machines. All others are simply bench-type machines that come with and without floor stands. However, some manufacturers do supply the bench machines with floor stands regularly.

All machines shown are of the tilting-arbor type, that is, the arbor tilts for angle cuts while the table remains level. Figs. 3, 5 and 8 picture machines with table wings, or extensions, which are supplied as extras. The wings add to the working width of the tables. Rip-fence extension bars are regularly furnished with many units, those pictured in Figs. 4, 8, 9 and 10 being examples.

Figs. 18, 19 and 20 show three steps in checking alignment of ripping fence with the blade, also the 90-deg. position of the blade with the table. These checks should be made periodically, especially if the machine gets rather hard use. If the table has never been removed from the base, you can usually rely on the grooves being in line with the blade, Fig. 18. But it's well to make a second check as in Fig. 19. Then set the blade at 90 deg. as in Fig. 20 and reset the pointer on the tilt scale to 0 deg.

Figs. 21 to 24 inclusive show methods used by experienced craftsmen when cutting narrow and wide stock to dimension. In all illustrations the blade guard has been purposely omitted for clarity. Always use the guard when it is necessary to work with your hands close to the blade. ★ ★ ★

Jig Made of Bricks Simplifies "Baling" Newspapers



Tying bundles of newspapers or magazines can be made easy by resting the bundles on two bricks placed on edge, or two blocks cut from a 2 x 4. The bricks permit the cord to be passed around the bundles without the necessity of lifting them.

John Comstock, Wellsboro, Pa.

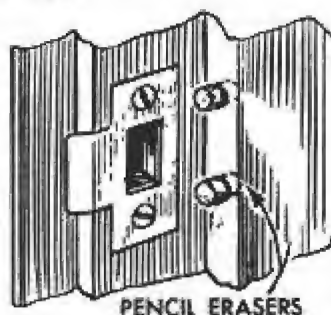
Method of Removing Wallpaper Utilizes Paint Roller

After trying every method except using a steamer—which he wanted to avoid because of hot, humid weather—one homeowner loosened wallpaper for removal by applying water with an ordinary paint roller. The latter was dipped in hot water, then rolled in a paint-roller tray to remove excess water. Several fairly uniform applications of water could be made, assuring thorough saturation of the paper. Because of its greater water-absorbing characteristics, a lamb's-wool roller was used.

Alfred Runyan, Los Angeles, Calif.

Pencil Erasers in Stop Strip Silence Rattling Door

Two pencil erasers fitted in a door-stop as indicated will silence a door that rattles because the latch fits loosely in the strike plate. After the erasers have been forced into holes drilled in the stop, they are trimmed with a knife until the door closes properly with the erasers bearing against one side.



Cork Inside Bottle Removed With Strip of Tape

Removing a cork that has been forced into a bottle can be done by dropping a strip of adhesive tape into the bottle as shown so the cork drops onto it. When the cork adheres to the tape, it is pulled into the neck of the bottle and held so a corkscrew can be inserted in it.



Rust on Stainless Steel Caused by Improper Cleaning

Rust streaks and stains on the stainless-steel trim, hub caps and grill of an automobile are not a reaction in the metal but are due to the use of ordinary steel scouring pads. Tiny slivers break off the scouring pads and become embedded in the stainless steel, where they rust and cause the unexpected stains. To remove the discolorations caused by use of the pads, use steel-wool scouring pads made of stainless steel. Adding a small amount of scouring powder also is an aid in removing the rust from minute scratches in the stainless steel. The best method of cleaning stainless steel is the same one used to clean the painted surfaces of the car; a soap-and-water solution followed by a clear-water rinse. When caked-on dirt and stubborn

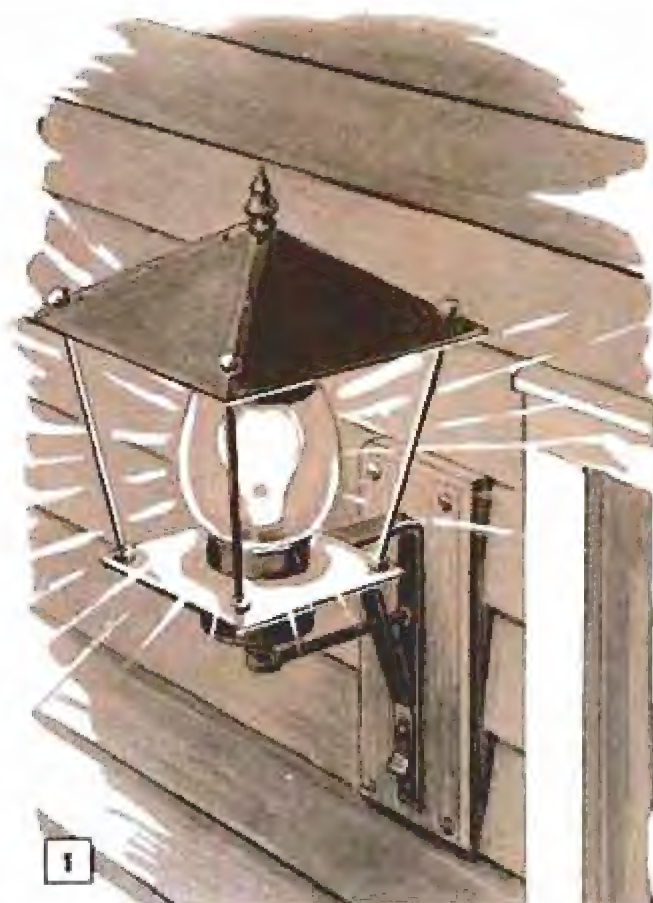
grease stains must be removed from stainless steel, use scouring powder and a damp cloth, before resorting to stainless-steel scouring pads. Rub the scouring powder and the steel-wool scouring pads in the direction of the polish marks in the stainless steel—"with the grain of the metal"—to prevent scratching and help preserve the luster of the metal. Road tar can be removed from stainless steel—and painted surfaces—by applying fuel oil to soften and dissolve the material. The residue then is washed with soap and water and rinsed with clear water. A cloth is used to wipe the metal dry to prevent water stains. No polishes, lacquers or other coatings are required to keep stainless steel shining.

Republic Steel Corp.

LAMPS—

Interior and Exterior

BOTH THESE LAMPS are based on antique themes, yet either will go well with the style and furnishing of a modern home. The outside lamp, Fig. 1, is built around a lantern globe, as shown in Figs. 2 and 4, that can be purchased at most hardware stores. The components of the lamp are cut and shaped from aluminum, Figs. 4, 5, 7 and 8. Brass or copper also could be used because of their weather resistance and easy workability. When aluminum is used, rivets, screws and nuts employed in the assembly also should be of aluminum. When shaping and assembling the parts for the outdoor lamp, make sure that ring D slips easily over part C. It is necessary to slide the ring upward to remove the lantern globe when the light bulb must be replaced. After disk G has been clamped between two plywood disks and the edge bent down to form a flange, right-hand detail, Fig. 8, it is riveted to ring F. This cup-shaped assembly then is



fastened to the lower surface of base B with machine screws and nuts. It is not riveted, as are the other components, because it may at some time be necessary to remove it to repair or replace the light socket. The socket is screwed to an assembly of $\frac{1}{8}$ -in. pipe and fittings, lower detail, Fig. 4, that is used to protect the wire leading into the house wall. A brass lamp finial is screwed to the center of the lamp cap, while the four supporting rods are capped with drilled and threaded brass balls, such as can be purchased at jewelers and lamp-supply houses.

The uniquely styled table lamp, Fig. 3, has a shade that suggests a Civil War drum, the four drum sticks around its column carrying out the theme, Fig. 6. Patterned translucent plastic is cemented to a pair of embroidery hoops to form a shade, a $\frac{1}{2}$ -in. lap being allowed on the plastic for

Laborsaving Leaf Carrier



Both time and labor are saved by this 10 x 10-ft. piece of canvas with rope handles sewed to the corners. Leaves are raked onto it, then it is folded over and dragged to the street to await the city leaf-disposal truck, or to a suitable area for burning.

Marcus L. Mulkey, Chattanooga, Tenn.

Amplify Door Chime Sound

If a door chime, bell or buzzer is not easily heard throughout a home equipped with forced-air heat, mount the chime on a cold or hot-air duct with two small sheet-metal screws. The reverberating sheet metal serves as a sounding board to amplify the sound which is sent through the ducts to all the rooms.

Fred Haitz, Sioux City, Iowa.



Low-Cost "Storm Shutter" Awning

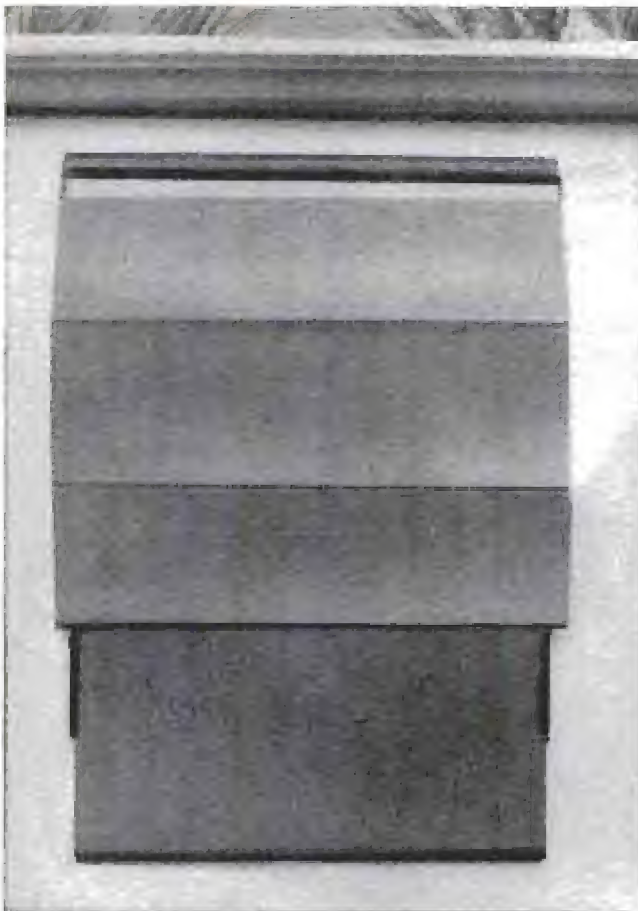
By Wyatt M. Wayne



UNDER normal circumstances this awning is an attractive means of sheltering a window from sun and rain. During a hurricane or high wind, a hidden flap drops down and the complete assembly fastens firmly to the wall. Wind-blown objects then strike it and are deflected, rather than shattering the window glass. Low cost, as well as adequate strength are built into the awning by using screw eyes and eyebolts rather than hinges, see details at right. Maximum strength in attachment to the house wall is assured by using lag screws to fasten a $\frac{1}{4}$ x 2 x 2-in. steel angle to the wall, then suspending the awning from the angle. In the original installation, this angle support was located 10 in. above a standard 38 x 51-in. steel casement window, which allowed room for the windows to be cranked open. On other types of windows the point of attachment for the angle would be different, as would the over-all dimensions of the awning itself. Covering for the storm awning is $\frac{1}{4}$ -in. hardboard. For the awning described, a piece of hardboard measuring 4 x 6 ft. is enough for the complete job. Note in the right-hand detail that the $\frac{1}{4}$ -in.-pipe support must have its pivot point on the wall arranged so that it supports the awning at the proper angle in the "up" position, yet must also pivot down to allow the flap and awning to be positioned flatly against the wall. When the dimensions are changed, this pivot point may require some adjustment to be correct. When the awning is in the "down" position, two lag screws, of the type shown in the lower right-hand detail that have a bolt end, are used to secure the flap against the wall. Wing nuts are turned on the projecting bolt ends. Originally designed for use in the hurricane area of the Southeast, this storm awning would be equally useful in areas of high winter winds. ★ ★ ★

Antifreeze Is Not Reusable

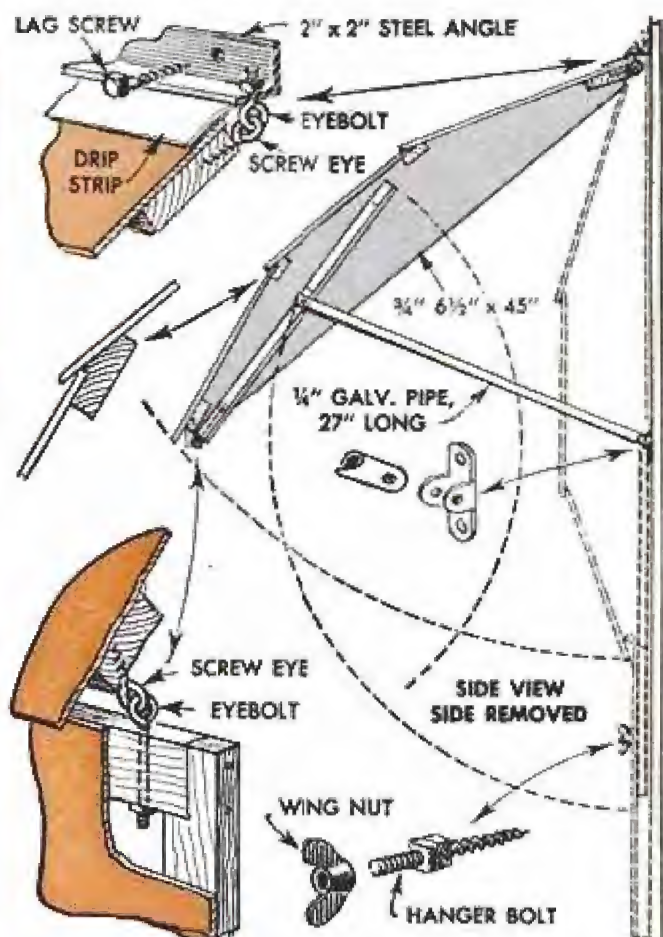
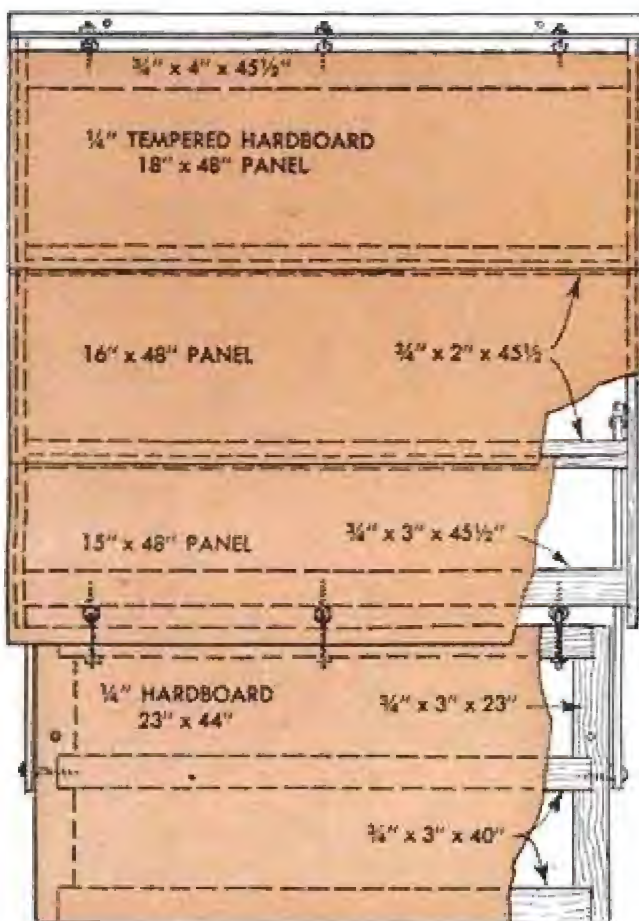
Because the rust inhibitor in antifreeze is dissipated during a season of use, the antifreeze becomes highly corrosive and should never be saved and reused the following year. Adding fresh rust inhibitor to the antifreeze seldom will eliminate the corrosion-causing factors in the solution.



In "down" position, as shown above, normally hidden flap is dropped down and bolted to the wall with wing nuts. Method of pivoting keeps edges of flap and awning aligned when they are bolted down



Above is shown the storm-shutter awning in the "up" position. The supporting braces for the awning part of the assembly are pivoted on the storm flap that swings up inside when the unit is held in this position



Yarn Used to Make Pictures on Sandpaper Drawing Board



Mother will have no worries about spilled paints or crayon marks on walls or floors when the children use this sandpaper "drawing board" with colored-yarn "paints." The board is made by cementing one or more sheets of coarse sandpaper to a piece of $\frac{1}{4}$ -in. plywood. Colored yarn, cut to lengths easily handled by youngsters, provides the drawing material. The loose weave of the yarn causes it to cling to the sandpaper to form outline sketches, and simply, removing it will "erase" any picture. — Leonard W. Mitchell, Detroit, Mich.

Simulated Wrought-Iron Items Cut From Tempered Hardboard

Simulated wrought iron or hammered-brass hinges, house numbers, monograms and other items can be cut from tempered hardboard. The pieces are cut to shape with a jigsaw or other power tool, then the edges are gouged with a sander or half-round file to simulate the appearance of hammered metal. The surfaces can be dimpled by using a ball-peen hammer to simulate wrought iron or hammered brass. Flat-black paint is applied to complete the project.—Masonite Corporation.

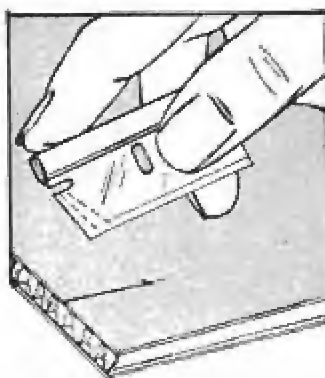
Rubber Tiles Are "Place Mats" On Barber-Shop Work Counter

Colorful mats on the work counter under the mirrors in one barber shop are not only attractive, but useful. The mats are squares of rubber tile purchased at a nearby tile store. The nonskid surfaces of the tiles prevent barber tools and bottles from sliding off the counter should someone accidentally brush against them, and the cutting edges of scissors and razors are not damaged by the resilient surfaces of the rubber tile.

A. R. Tanner, Jr., Poughkeepsie, N. Y.

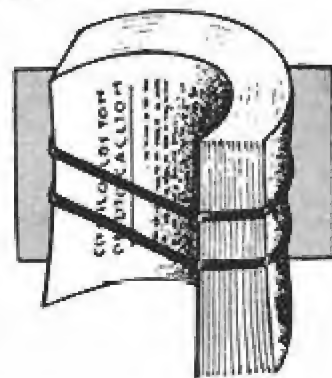
Dulled Razor-Blade Corners "Sharpened" With Pliers

When the corners of a razor blade, used for cutting paper or cardboard, become dulled, they can be "sharpened" by breaking off the blade corners with a pair of pliers, as indicated by the dotted lines.



Rubber Band on Gummed Labels Eliminates Curling Problem

Shipping labels tend to curl toward the glued side, making it difficult to address them in a typewriter or by hand. To overcome this, curl the pack in the opposite direction and snap a rubber band around it.



Initials Identify Overshoes

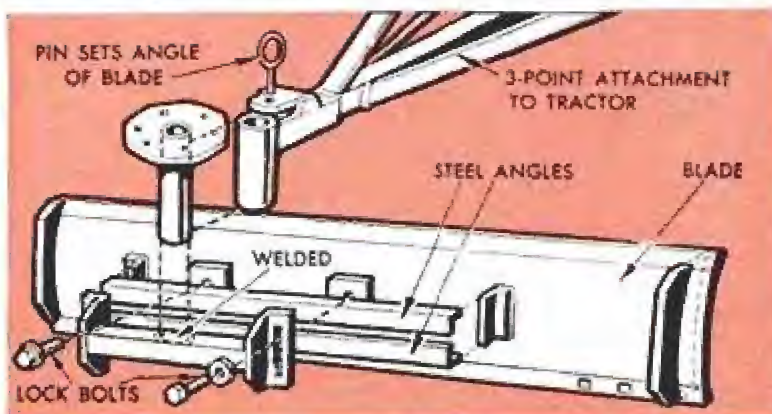
Your children will have little trouble finding their rubbers and galoshes in the school cloak room, or hall closet at home if initials cut from tire patches are cemented to the footwear. The cement provided with the patching material will keep the initials firmly attached.

Magnet Holds Baby Pins

You can eliminate the need for searching for lost pins which present a hazard to a baby, by fastening a small magnet to the bathinette to hold the pins. Inexpensive magnets are available drilled and with screws for easy attachment. — Charles V. Mathis, Wildwood-By-The-Sea, N. J.

BULLDOZER BLADE

Designed for use on a tractor that has a drawbar with 3-point suspension, this bulldozer blade has a feature not usually found on such blades. Besides being adjustable to various angles, and being reversible, the blade can be offset to either side so it extends beyond the wheels. This feature makes the blade ideal for working close to buildings and foundations, and for filling ditches. Two steel angles welded to the back of the blade form a slot in which two drilled and tapped blocks of steel can be moved, as shown in the detail. Lock bolts keep the blade in position when it is adjusted. The vertical member of the blade support is a length of steel pipe welded to the horizontal bar as shown. A drilled and tapped disk is screwed to the upper end of the pipe.



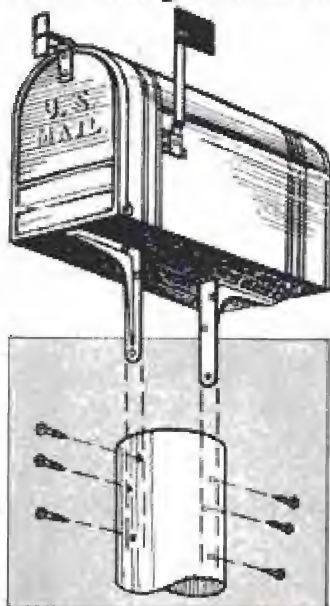
Chute Above Rack Simplifies Feeding Baled Hay

Feeding baled hay to the livestock is much less work in this barn where a chute and a number of doors leading from the hay mow open directly above the feed rack. Baled hay dropped through the chute and doors lands in the rack, where the ties are cut and the hay scattered. The rack is located so that stock can feed from both sides, and it also can be used to keep beef cattle separated from milk cows.

A. M. Wettach, Mt. Pleasant, Iowa.



Attaching Rural Mailbox



One of the simplest ways of attaching a rural mailbox to a suitable post so it is anchored securely against wind and weather is to use two shelf brackets. Small stove bolts are used to fasten the brackets to the bottom of the mailbox, and long wood screws then are fitted in the other legs of the brackets and driven into the post.

Light Denies Corn to Raccoons

Randy Currans of Traer, Iowa, solved the raccoon problem in his sweet-corn patch by burning a road flare on a 6-ft. post every night for three weeks before harvest. Corn in the lighted area was untouched by the animals whose appetites were not as strong as their aversion to the light, even though it was not exceptionally bright.

WORK SAVING

By A. M. Wettach

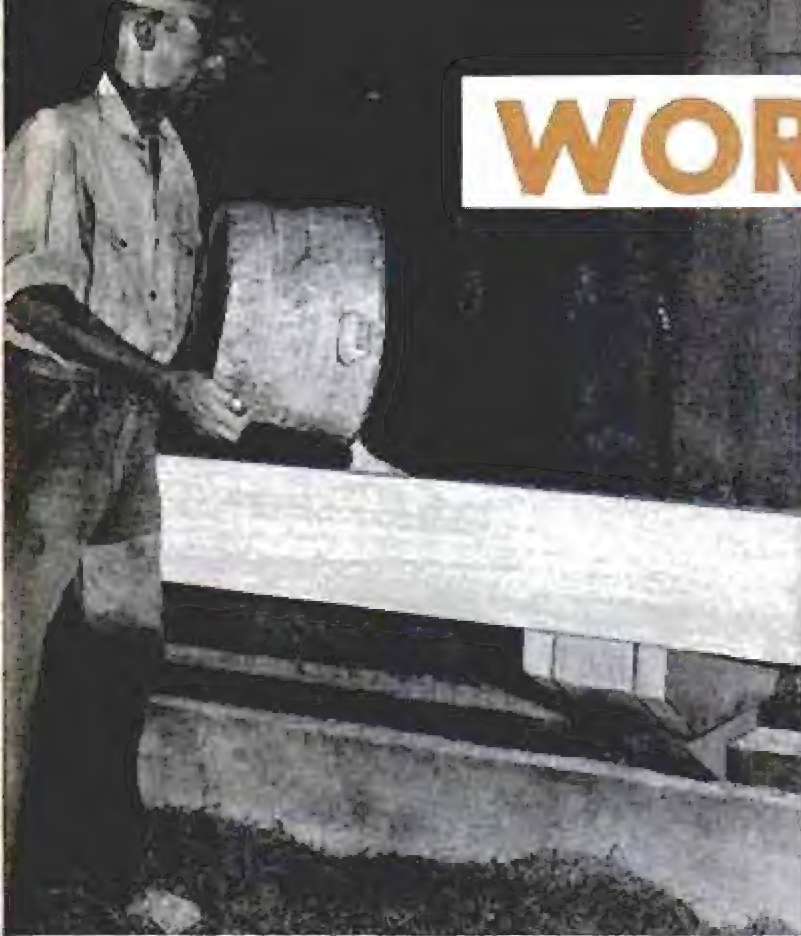
TO MAKE livestock feeding easier and quicker, here are several handy feeders that can be made on the farm using common materials and tools. Bunks that are used for dispensing feed in large quantity are attached to the building in which the feed is stored or prepared for use, while other feeders are mounted on skids or runners for convenient moving to pasture or feedlot. A few of the feeders are provided with some type of shelter, such as the novel but useful salt rack shown on the opposite page. A vane bolted to the top of it enables the revolving feeder to point into the wind so that rain and dust do not blow into the opening on one side.

Upper left, no supporting legs are in way of cattle feeding at this bunk which is attached to inside wall of cattle shed. Front and bottom of bunk are made of 2 x 10 planks nailed to heavy wooden braces that are nailed to sill and upright-framing timbers

Center left, stanchion-style feed bunk in cattle shed keeps feed waste to minimum by preventing cattle from dragging hay out of bunk and trampling it. Baled hay is dropped through mow-floor openings directly overhead for convenient scattering in bunk

Below left, minerals and salt are kept dry, yet accessible to cattle at all times, in sheltered feeder made of rough-sawn pine lumber cut to size and bolted together throughout for sturdiness. The 4-ft.-sq. box has separate compartments for minerals, salt

Below, heavy-duty feed bunk for cattle is made from large boiler cut in half. Sturdy legs cut from 2-in. steel pipe and welded to tank sides at each end provide support for bunk at desired height. Bunk is ideal for grain, ground feed, silage or water



LIVESTOCK FEEDERS



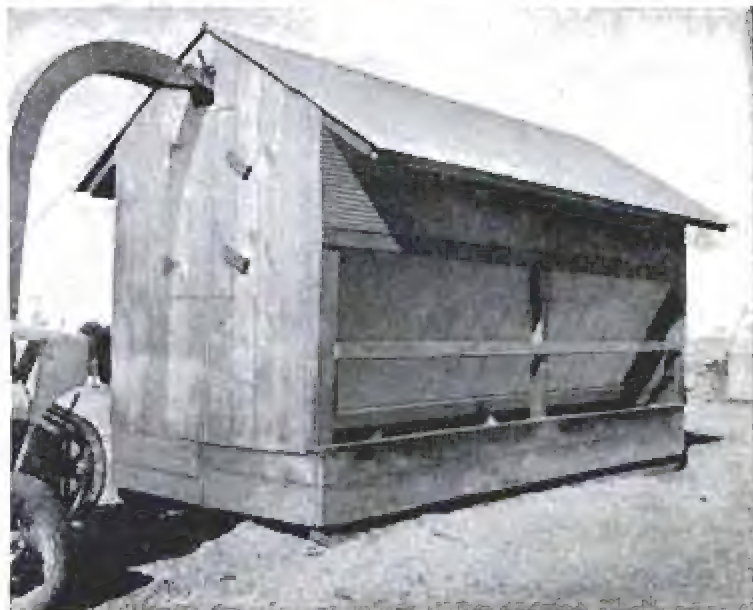
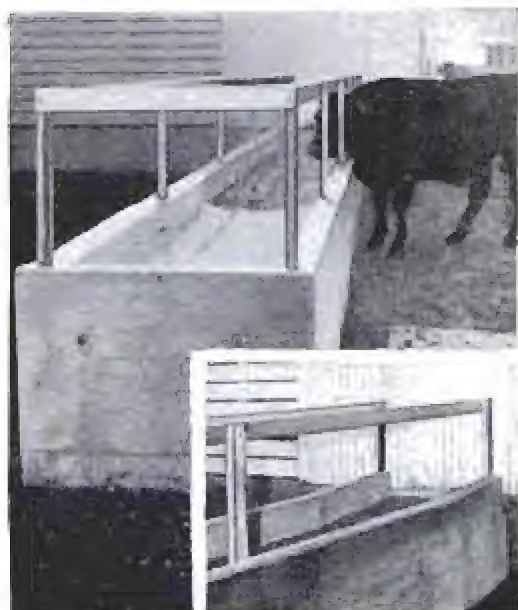
Above, rims from two discarded manure-spreader wheels cut in half and bolted to underside of feed bunk, provide sturdy legs and serve as runners for easy moving to new location. Lengths of steel angles welded to rims, prevent them from spreading

Right, vane on revolving salt rack for sheep permits rack to head into wind to protect salt from rain. Metal basket is nailed to platform on which pipe flange and length of pipe are screwed. Latter turns in larger pipe and flange assembly bolted to wheel



Below left, poured-concrete bunk for feeding ground feed and grain to cattle is attached to granary to save work. Sliding door permits direct access to bunk from granary. Framework at top consists of a channel-steel rail that is bolted to steel posts

Below right, 9 x 16-ft. self-feeder for livestock holds 100 bales of chopped hay and has 2-ft. side manger on each side. Uprights are 4 x 4s to which 2-in. planks are bolted to height of 18 in. for sturdy base. Note substantial overhangs on roof



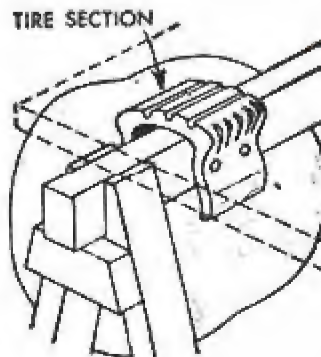


Cleaning Solution Fed to Brush From Attached Plastic Bottle

You can avoid the time-consuming job of constantly dipping a brush in cleaning solution when removing soil from clothing, by attaching the brush to a plastic squeeze bottle in the manner shown in the detail at left. To do this, drill a $\frac{1}{16}$ -in.-dia. hole through the back of the brush. Then counterbore this hole to take a screw-type cap that can be turned on the plastic bottle as shown. Next, the cap is permanently secured in the counterbore with waterproof plastic cement. A $\frac{1}{16}$ -in.-dia. hole is also drilled in the cap. This should be done after cementing it in place, to assure proper alignment with the small hole drilled in the brush, for proper passage of cleaning fluid to the bristles. When cleaning solutions that evaporate quickly are used, the brush is removed from the bottle after each use and a tight-fitting cap is screwed on in its place.

Tire Sections on Sawhorses Protect Work From Damage

To prevent marring woodwork that is being sanded or sawed on sawhorses, nail short tire sections to the top of each sawhorse stringer as indicated in the accompanying detail.—Harry J. Miller, Sarasota, Fla.

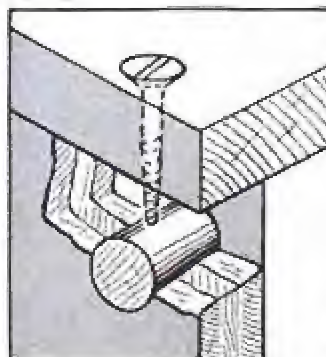


Magnet "Spots" Brass Plate

When shopping for door locks, drawer pulls or other hardware, a good way of determining whether you are paying for solid brass or only plated items, is to test them with a small pocket magnet. Brass or aluminum will not be attracted to the magnet whereas brass-plated steel will.

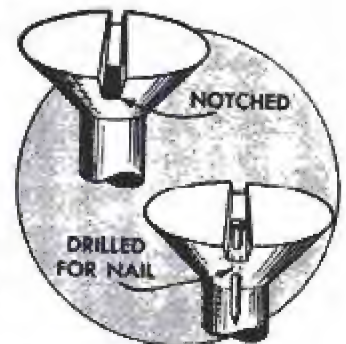
Crosswise Dowel in Plywood Holds Screw Securely

Holding power of a screw driven in the edge of plywood can be greatly increased if a dowel is glued in a hole drilled at right angles to the plies as shown.—Frank A. Javor, Newark, N. J.



Wood Screw Securely Anchored With Small Finishing Nail

Wood screws can be prevented from working loose by "locking" them in place with small finishing nails. There are two ways of doing this as detailed at right. One method is to file a sharply angled notch in one end of the slot to accommodate a nail as indicated. This is most easily done when the screw has been driven deep enough to remain upright while filing. If it becomes necessary to remove the screw, the nail is merely driven all the way into the wood. A second method consists of drilling a small hole through the screwhead to take a nail as shown.



One-Man Handling of Joist Aided by Bent Nail

Where you have no help to lift the end of a long joist and hold it in place, try a heavy nail as a substitute. Drive the nail into the joist as indicated, and bend it to form a supporting hook to hold the member in position.



On the MARKET

for Do-It-Yourselfers



1. SPECIAL CLEANER for aluminum removes accumulations of grime and oxidation from aluminum storm doors and windows, household utensils and appliances. Comes as a kit with two fine steel-wool pads for application
Corky, 337 Washington Ave., Newport, Ky.

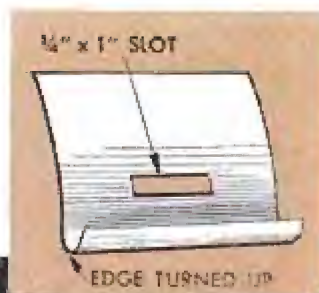
2. PLASTIC CEILING TILES are designed for easy application with adhesive or staples. The tiles are washable, waterproof, fire-resistant. They come in a variety of 3-dimensional patterns, 6 tiles to a panel, in white and color
Hallmark Plastics Corp., 151 Division St., South Hackensack, N. J.

3. NONFLAMMABLE PAINT REMOVER of the wipe-away type will remove several coats of paint, enamel or varnish in one application. Comes as a dry powder in 1½-lb. cans. Contents mixed with water makes 3 qt. remover
Antique Corner, South Bend 24, Ind.

4. CERAMIC CABINET HARDWARE combines the texture of ceramics with the appeal of polished metal, bringing a new concept of color and dimension to modern cabinet work. Presently offered in two sizes and three colors
Stanley Hardware, Div. of Stanley Works, New Britain, Conn.

5. WINDOW-WALL UNIT makes possible substantial savings in labor and time for builders and do-it-yourselfers. Eliminates over half the steps involved in framing conventional rough opening for regular window unit
Anderson Corp., Bayport, Minn.





Eraser Shield for Typewriter Protects Key Mechanism

To prevent an accumulation of eraser fragments from fouling the key levers of a typewriter, use this simple but effective shield. It is held with one hand, while the other hand is used to do the erasing. The shield is made from very thin sheet metal, such as half-hard brass, that will not bend out of shape easily when handled. A cut-out about $\frac{1}{4} \times 1$ in. is ground at the approximate center of the shield. Grinding is suggested, rather than either cutting with hammer and chisel, or punching out the opening, to avoid distorting the thin sheet metal. Round all four corners of the sheet with a file, then bend one edge to form a trough. Bend the metal to the same curvature as the surface of the typewriter platen for a short distance above the trough. The rest of the metal is left straight. Remove all burrs on the edges and smooth with emery cloth. Shellac to prevent tarnish.

Magnet Holds Shopping List

If you have steel cabinets in your kitchen, a small magnet makes an ideal "nail" for attaching messages, shopping lists, and notes to the doors.

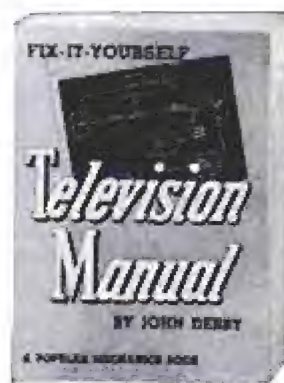
Radio Heat Softens Polish

If paste shoe polish has become hard and lumpy in the can, set it on top of your small bedroom radio, and the heat from the radio will soften the polish.

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GRINDING WITH SOUND

By Richard F. Dempewolff

SOUND WAVES, pitched so high they cannot be heard by the human ear, now are being utilized as "hammers" to drive abrasives through the hardest substances. The process is known as ultrasonic impact grinding and is made possible by a distinctive property of certain metals—notably nickel. The impact grinder employs a coil having a core, or stack, built up of nickel laminations. Electrical current is passed through the coil at an ultrasonic frequency of 27,000 cycles per second. Directional forces in the electromagnetic field thus set up cause the nickel laminations to expand and contract over a microscopic distance of about .0004. This movement, or vibration, of the coil core, taking place in the ultrasonic frequency range, is amplified first by a bank of vacuum tubes, then mechanically transmitted by a metal cone to which the die, or tool, is brazed. The cones are shown in various common shapes

SHOP NOTES

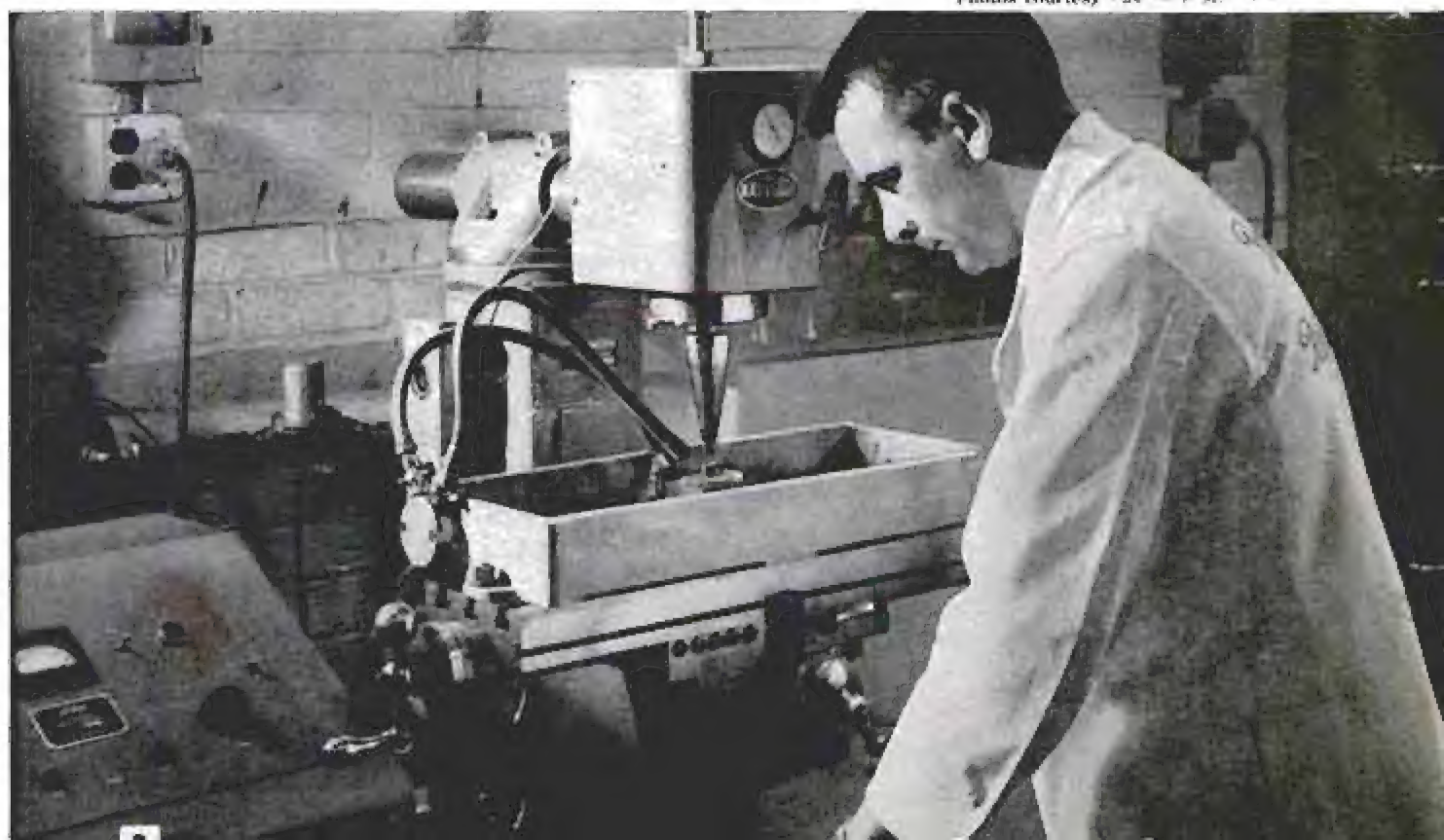


Relief work cut into glass with ultrasonic impact grinder. Note accuracy of extremely intricate detail

in Fig. 4, A to F inclusive. In practice the work is located directly under the tool which is lowered until the point, or face, is very near the work surface, but never in actual contact with it as is a conventional cutting tool or grinding wheel. The relationship of the tool and work are shown in

Floor-type impact grinder closely resembles a vertical milling machine when set up for operation

Photos courtesy Raytheon Co.





A

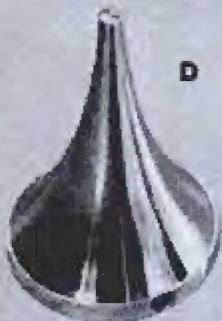


B



C

4



D



E



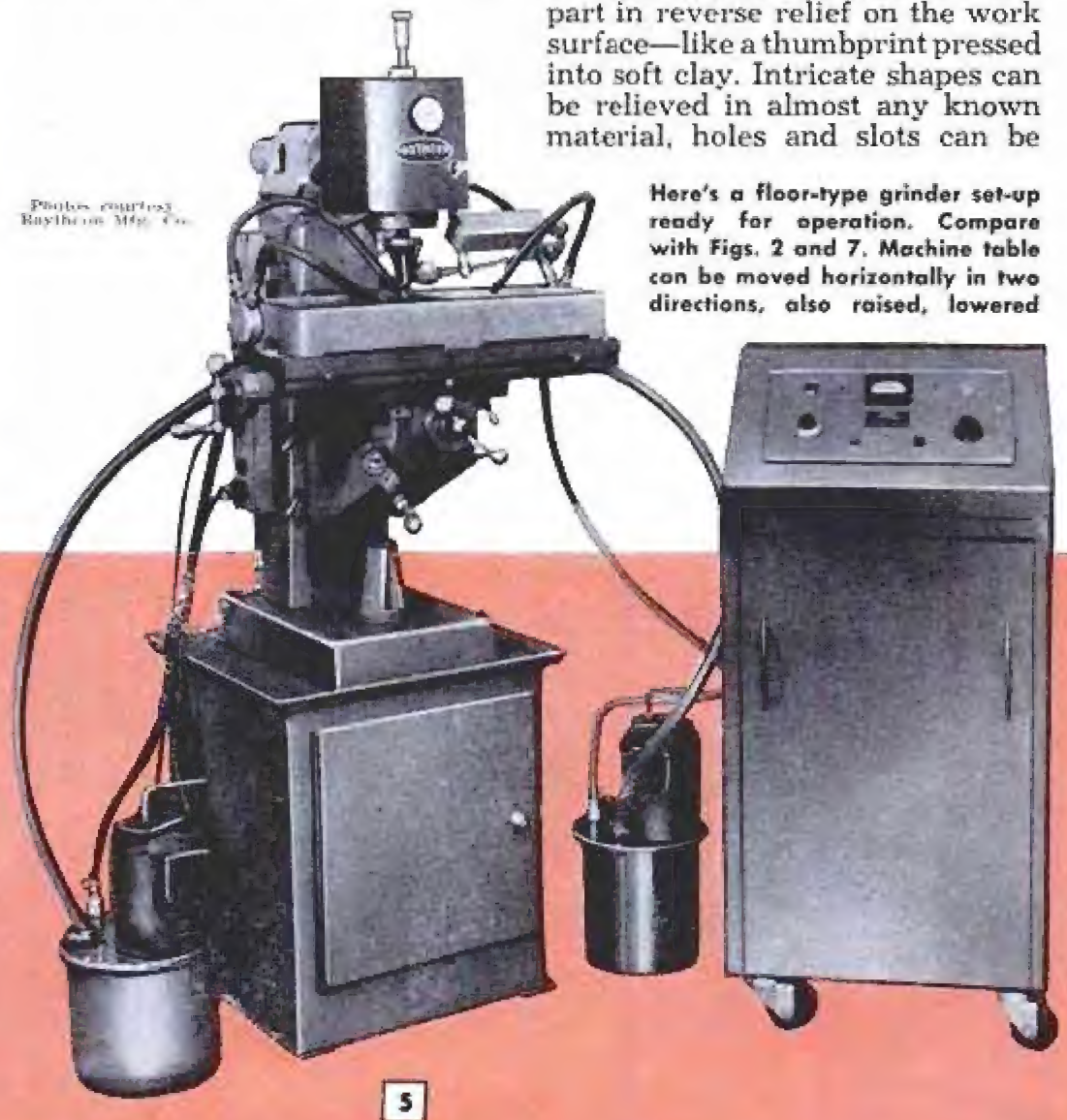
F



Photo courtesy Vibro-Ceramics Corp.

Above, bench-type impact grinder is designed for light work on small parts. Left, transducer cones of various shapes carry the tools, which are brazed to the tips. Note in Fig. 6 how tool cone is attached to the transmitting cone with threaded stud

Photos courtesy Raytheon Mfg. Co.



5

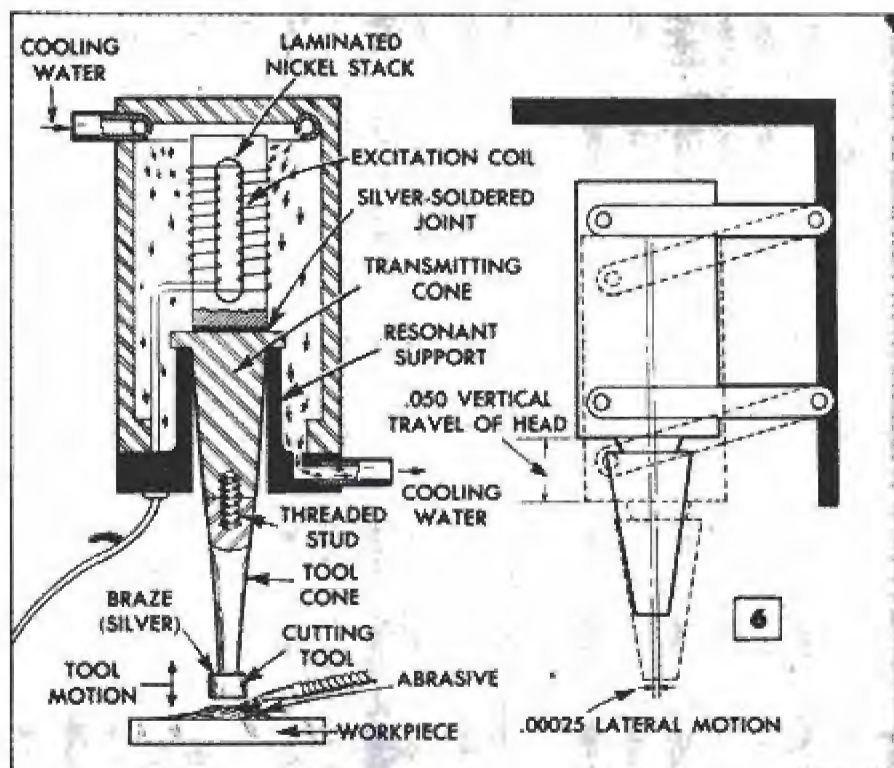
Fig. 6, the details being greatly exaggerated, of course, for purposes of clarity. When the unit is in operation an abrasive mud, or slurry, flows across the work in a steady stream. As the abrasive grains pass between the tool and the work surface, vibration of the tool causes the abrasive to cut into the material. Striking the surface of the work with terrific impact (up to 150,000 times the weight of the individual grains) the particles chip, or grind, an exact counterpart of the tool face into the work surface—hence the name impact grinding.

For drilling a straight, round hole a flat-faced cylindrical tool is brazed to the bottom of the cone-shaped toolholder. For working more intricate shapes any relieved pattern that can be engraved or stamped on brass or mild steel becomes a tool for transmitting the forces that drive abrasive into the workpiece, producing its counterpart in reverse relief on the work surface—like a thumbprint pressed into soft clay. Intricate shapes can be relieved in almost any known material, holes and slots can be

Here's a floor-type grinder set-up ready for operation. Compare with Figs. 2 and 7. Machine table can be moved horizontally in two directions, also raised, lowered

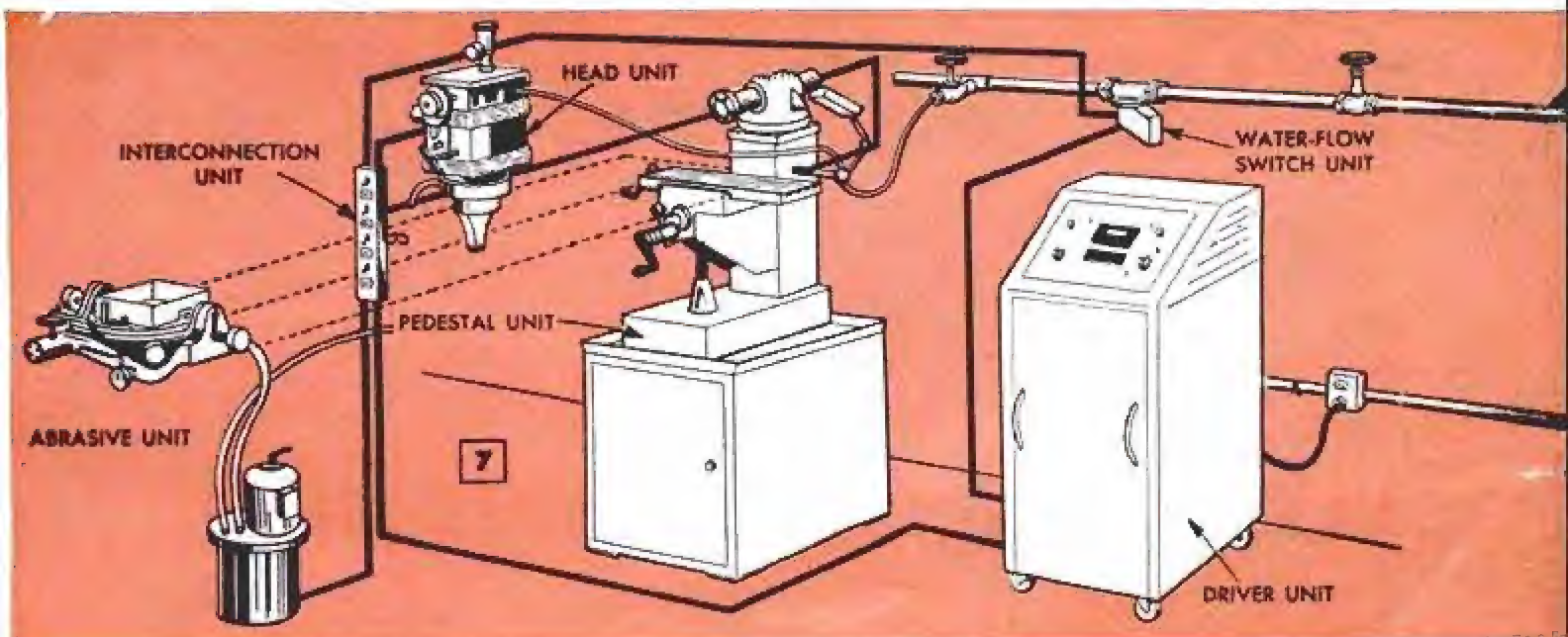
drilled through, and many materials can be sliced down to only a few thousandths of an inch in thickness. An example is the slicing of delicate quartz radio crystals, the actual operation being shown in Fig. 10. Fig. 1 pictures a relief engraving in glass, while Figs. 11 and 12 show how complex patterns can be drilled into and through various materials. In addition to engraving, jewelry and diemaking, the impact-grinding unit also performs such common shop operations as drilling, reaming and broaching. Experimental work now being carried out will, of course, widen the field of application to include many operations now done by contact cutting tools of conventional types.

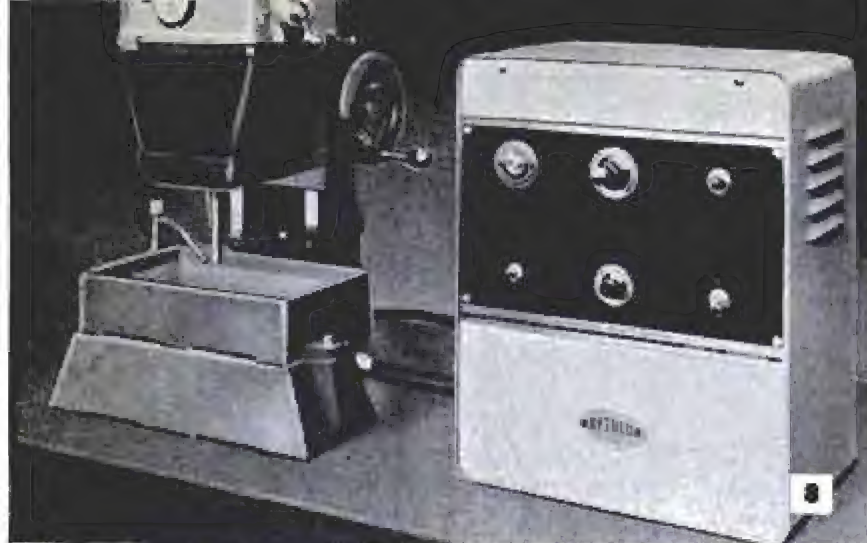
In present practice, impact grinding is carried out on areas up to about 3 sq. in., depending on the type of material being worked. Larger areas can be handled if the desired shape is of such a nature that it can be roughed out or partially completed beforehand by conventional methods. Where the type of work will permit, successive cuts often are used to work large areas. Finish on the workpiece is controlled by the grade of abrasive used. Fine abrasives produce a finer surface finish and generally permit holding of closer tolerances than do the coarser abrasives. Of course, where cutting speed is among the first requirements, a coarse abrasive generally is used.



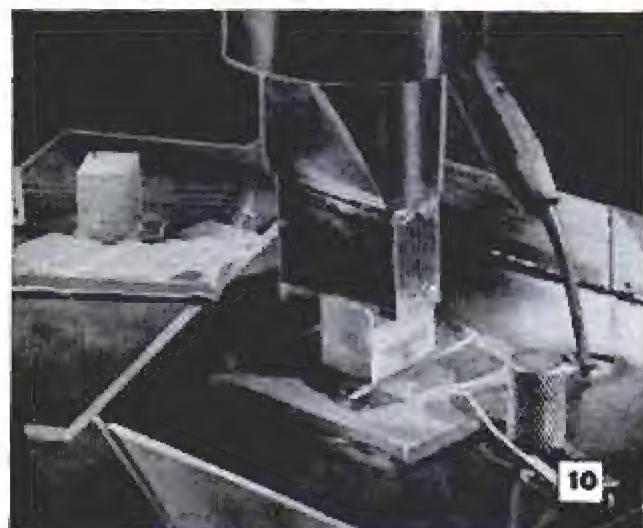
"It normally is not necessary to clamp the work," explains Patrick Duran, application engineer for Raytheon, manufacturer of impact grinders. "There is no tendency for the tool to wander. The absence of direct tool-to-work contact and the presence of cool abrasive mean that impact grinding is a cold-cutting process. Work material is not stressed or distorted in any way and, of course, is not raised in temperature."

The only appreciable heat generated in the operation is in the wire coil through which current passes at an ultrasonic frequency. The coil is water-cooled as will be noted from Fig. 7. In general appearance and size impact grinders of the floor type closely resemble a vertical milling machine, Figs. 2 and 5, also Fig. 7, the latter showing

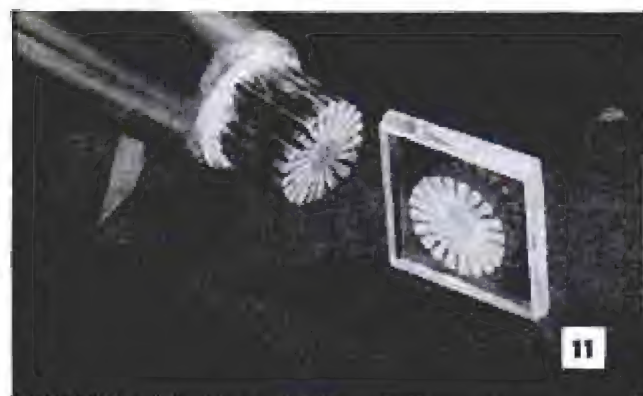




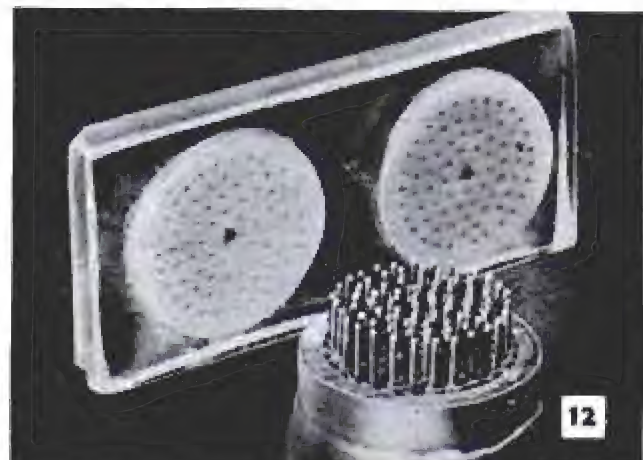
Photos courtesy Raytheon Mfg. Co.



Above, actual operation of slicing radio crystals from quartz. Tool consists of laminations spaced .012 apart. Below, Figs. 11 and 12, picture intricate patterns cut into and through various kinds of materials



Photos courtesy Raytheon Mfg. Co.



the floor-machine assembly. When machined, or ground, on these units the work usually is fed upward to the tool. On smaller bench-type units, Figs. 3 and 8, the tool generally is fed downward into the work, which is stationary. The workpiece usually is placed on a suitable mounting pad, Figs. 2, 9 and 10, and both the pad and work are then placed in a retaining tray, or pan, which is attached to the machine table as pictured. In some instances this unit is held in an adjustable subbase which is provided with a fine adjustment for positioning the work under the tool, Fig. 7. The abrasive slurry is pumped through tubes to directional nozzles, the overflow being caught in the tray and returned to the pumping units, Figs. 5 and 7.

Cutting speeds are governed by several factors such as the type of material, the quality of finish required and, of course, the grade of abrasive used. As examples, the average cutting rate in a hard material such as tungsten carbide will run about .009 inch per minute. In glass the cut progresses at a rate of about .100 inch per minute. On the very hard materials, each "traverse" of the tool may cause the abrasive grains to cut into the surface to microscopic depths only. It is the extremely rapid rate of the abrasive action that makes possible the comparatively fast cutting speeds. The tool usually is made from softer material than the workpiece, tools of brass or cold-rolled steel commonly being used to work such materials as tungsten, glass and ceramic. Although the action of the abrasive wears away the tool, the wear is at a slow rate and is always uniform. For this reason the accuracy of the tool is not impaired by the abrading action. ★ ★ ★

How to Test a Paintbrush

A certain amount of spring in the bristles is a feature of a good paintbrush. Bristle elasticity is easily tested by stroking the brush across the back of your hand.

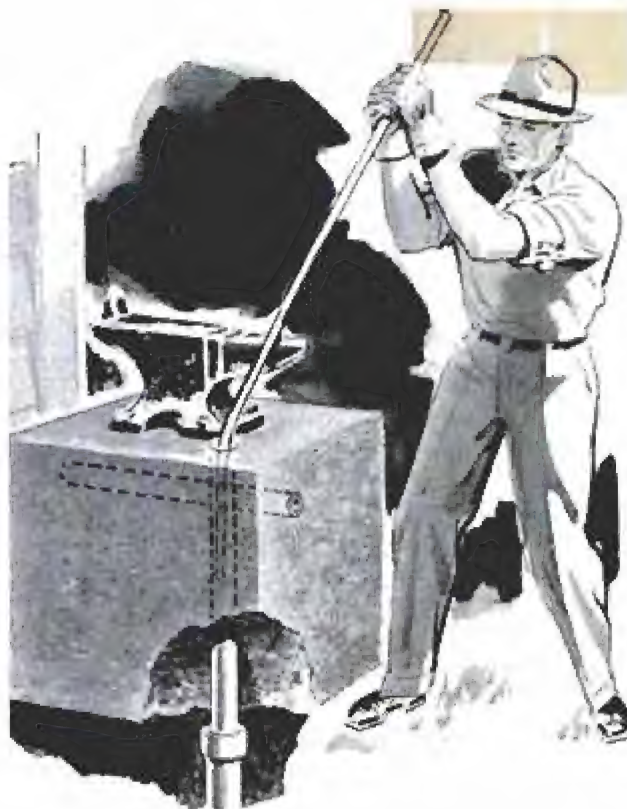
Concrete Base for Shop Anvil Serves as Pipe Bender

Ideal for bending pipe and tubing is the setup shown, which consists of a block of concrete in which lengths of pipe are embedded both vertically and horizontally. The lower end of the vertical pipe fits in a length of clay tile that provides for additional length. Gravel is placed under the end of the tile for drainage. The concrete block can double as a support for an anvil or steel block on which metal work can be done. An anvil can be used in conjunction with the vertical pipe for making bends.

Mrs. T. F. Watts, Charlotte, N. C.

Spark-Deflecting "Sleeves" Cut From Inner Tube

Protection for your arms against hot sparks when welding or cutting metal may be provided by "sleeves" cut from lengths of inner tube. A strap riveted to the upper ends of the sleeves fits across the back of the neck to hold them in place.



Milk Room Warmed by Heater Taken From Automobile

The milk room on one Iowa dairy farm is warmed in winter by an automobile hot-water heater. Hot water for the heater is furnished by the automatic hot-water tank in the milk room which normally heats water for washing equipment. A thermostat, located at a distance from the heater, controls the fan motor of the heater.

O. V. Gordon, Des Moines, Iowa.

25th St.

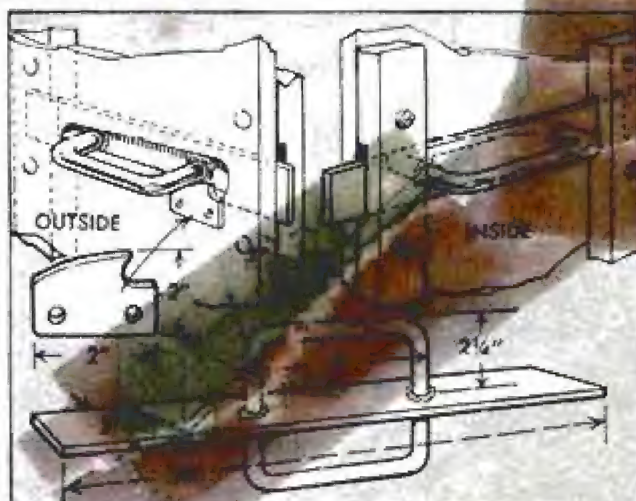
Hinges Lubricated With Soap

To avoid the problem of stains caused by oil, use ordinary bar soap to lubricate squeaking hinges on interior doors. Pull the hinge pin, wipe it with soap and reinsert it. The soap lubrication will last a considerable length of time.



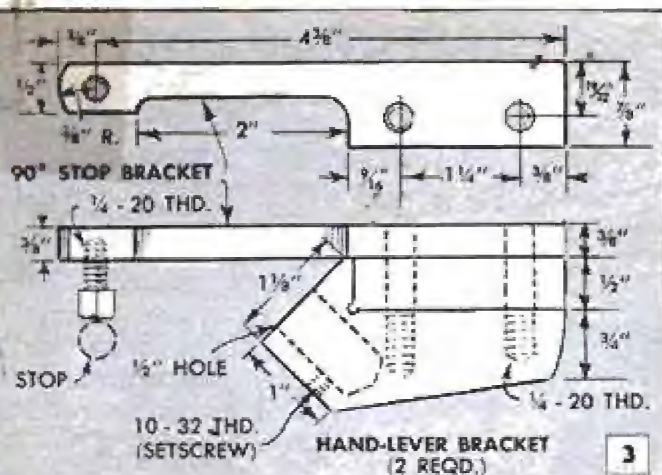
Sliding Latch on Farm Gate Is "Livestock Resistant"

Easily opened by a man wearing mittens, yet resistant to being opened by livestock, this gate latch consists of a length of flat steel that slides in notches cut in vertical wooden members bolted to the gate. Welded to each side of the flat is a U-shaped handle bent from $\frac{3}{8}$ -in. steel rod. These handles also limit the travel of the flat. When the latch is in the "locked" position, the handle on the outside surface of the gate engages a notch cut in the corner of a 2 x 2-in. piece of steel plate bolted to the gate as shown in the left-hand detail. Thus, opening the gate requires that the latch be lifted, then slid back the limit of travel.



S 10-60



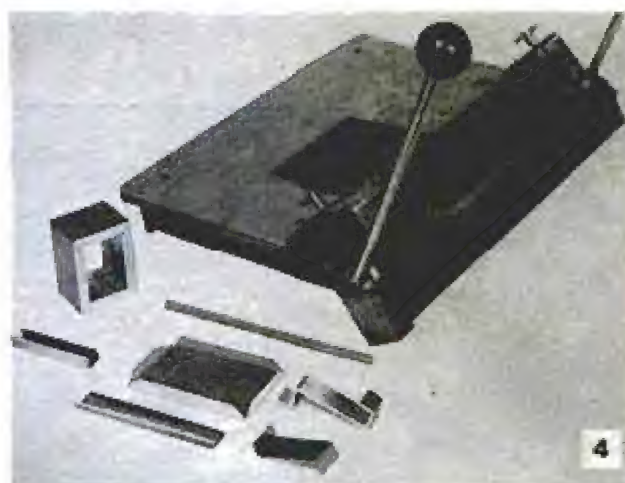


FOR YOUR SHOP

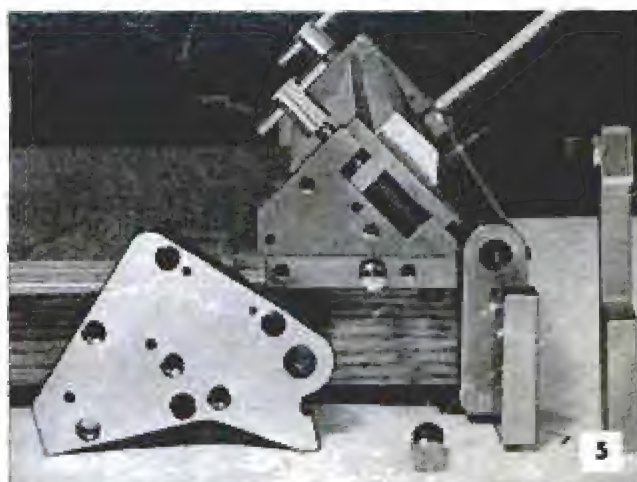
By Ferd C. Iglehart

THIS BRAKE is small-shop size, makes those clean, sharp bends in sheet metal that will delight the eye of a craftsman who has had to improvise methods of bending. It takes light sheet metals up to 17 in. wide. The hold-down blade moves at an angle of 45 deg. to the bed and adjusts automatically to the thickness of the materials to be bent. The blade is slotted to provide the clearances necessary to permit raising, in successive steps, 1/2-in. flanges on the four sides of the work, as in forming a box or tray, radio chassis, motor base, or similar work. A retractable stop at the 90-deg. position permits the operator to make repetitive right-angle bends. The throat opens to 5/16 in. to admit flanged parts.

All main parts except the table, or base, are made from cold-rolled stock. These include the parts detailed in Figs. 1 and 3 and parts A to E inclusive in Fig. 2. Note that parts A, B and C are shown assembled in the upper left-hand sectional view in Fig. 2. See also Figs. 4 and 5. Stock 3/8 and 1/2 in. in thickness is used for the right and left end plates and the hold-down supports and guides. The bending-bar brackets also are of 1/2-in. stock. Note in the right-hand detail, Fig. 2, showing end plate and hold-down support assembled, that the right end plate is a duplicate of the left plate with the exception of the lug formed on the lower edge of the latter. Note also that screw holes are counterbored to take socket-head screws flush. The hole pattern for 5/32-in. steel dowels is not dimensioned; only the approximate positions are shown. Where a lathe is not available use a straight 3/8-in. rod for the stop and substitute 5/16-in. cap-screws for the spring-tensioning screws. This will simplify construction without affecting operation of the brake.



Above, brake and examples of flanged work done in light sheet metals. Below, brake assembly with left end plate, handle and 90-deg. stop removed to show hold-down support and spring-tension device



Plug of Power Tool Is Locked in Workbench Drawer

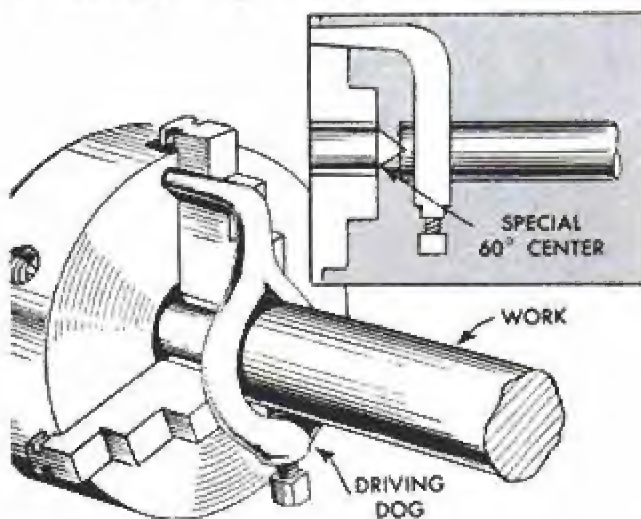


To prevent youngsters from operating a potentially dangerous power tool that frequently is left on a workbench, cut a notch in the front of a drawer that is fitted with a lock. When the tool is not being used, drop the plug inside, with the cord in the slot, and close and lock the drawer.

Washer Storage

To store nuts, washers or bushings neatly, use a metal disk about 12 in. in diameter to which are welded or soldered lengths of steel rod. The various items then are fitted over the steel "pegs" that are spaced 3 in. apart around the disk edge.

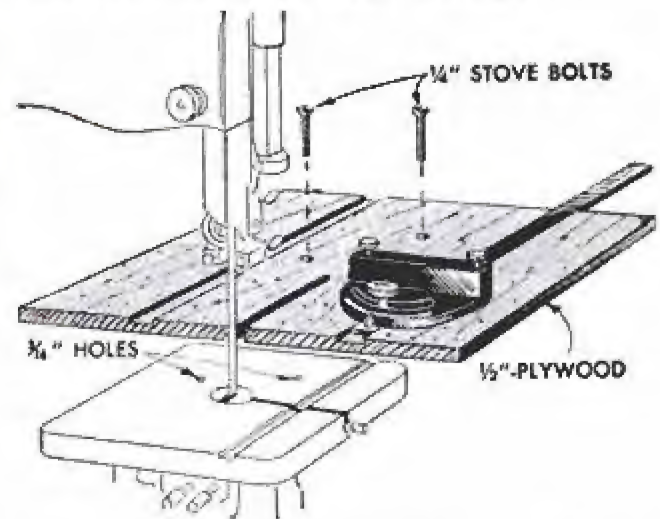
Chuck Jaw Drives Lathe Dog In Emergency Setup



There is no need to remove the chuck from a lathe and replace it with a driving plate to turn work between centers, if the setup used by one machinist is employed. A piece of round stock is chucked in the lathe and a 60-deg. point is turned on it. The workpiece, which previously has been center-drilled at each end, then is mounted between this special center and the tail-stock center. A dog is used to drive the work, being driven itself by one chuck jaw as indicated. When the special center is re-used, it is centered as close as possible, then a finish cut is taken to assure absolutely accurate centering.

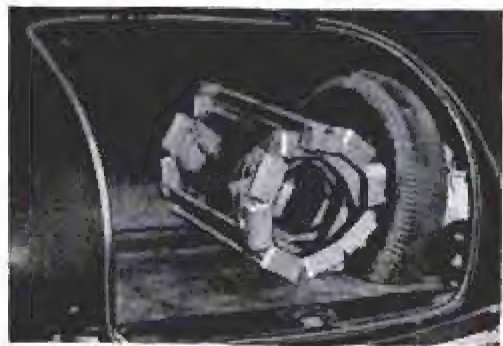
Frank L. Rush, Columbus, Ohio.

Auxiliary Table on Bandsaw Accommodates Miter Gauge



When attached to a bandsaw table, this table of $\frac{1}{2}$ or $\frac{3}{4}$ -in. plywood accommodates a miter gauge, and does not interfere with the usefulness of the bandsaw for most jobs. Width of the plywood should be about 1 in. more than twice the width of the miter-gauge head. First, make a cut centrally and halfway across the table to take the bandsaw blade. Then, cut two parallel grooves, one on either side of the cut, and equidistant from it, for the miter gauge. Position the table so the miter gauge is at right angles to the line of the bandsaw cut, then attach it to the table of the bandsaw with two $\frac{1}{4}$ -20 stove bolts. Counter-sink the bolt heads in the plywood.

SHOPPING FOR TOOLS



1. ROLL-UP LADDER comes in 10 and 12-ft. lengths and rolls up into a bundle about 21 in. in diameter, just as you see it in the photo above, showing it placed in a car trunk. The rails consist of wooden blocks 4 in. long, 1½ in. thick and 2¾ in. wide. When ladder is unrolled the blocks are clamped end-to-end by lengths of aircraft cable, resulting in rigid units that will support more than 1000 lb. The rungs are of oak and are of the step type, 11/16 in. thick and 1¾ in. wide. Average weight is about 25 lb.

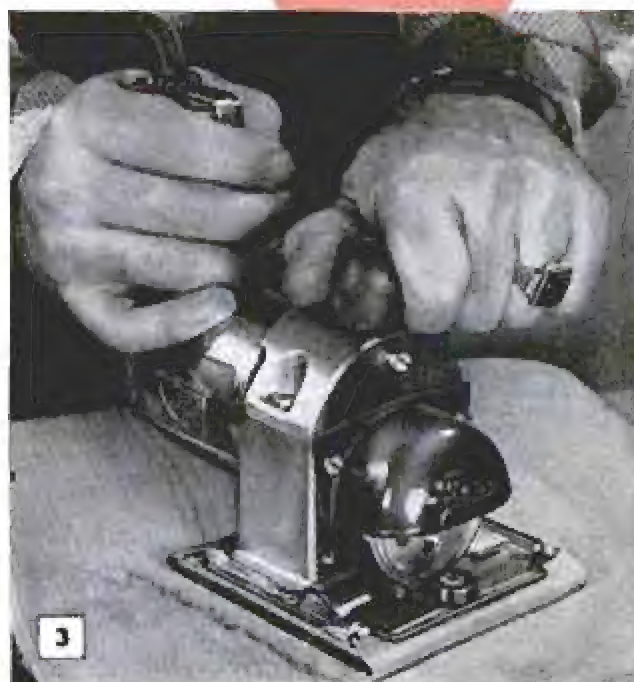
Dick Blick Co., Galesburg, Ill.



2. DIRECT-DRIVE CHAIN SAW is available in 18, 24 and 30-in. bar lengths. Has a specially designed, self-feeding chain, permitting freer, faster cutting with a minimum of pressure. A roller-bearing nose sprocket has been found by tests to produce at least 20 percent more cutting power by reducing friction at this heavily loaded point. A diaphragm carburetor permits operation at all work angles. Moll Tool Co., Div. of Remington Arms Co., Inc., Bridgeport, Conn.

3. PAD SANDER AND JIGSAW ATTACHMENT for ¼-in. portable drill are interchangeable on the same portable drill, which has been designed especially for mounting the two attachments. The drill housing immediately back of the chuck is squared, permitting rigid mounting of the accessory jigsaw and sander. Only pad-sander unit is pictured. Jigsaw is quite similar, employing same direct drive from drill chuck.

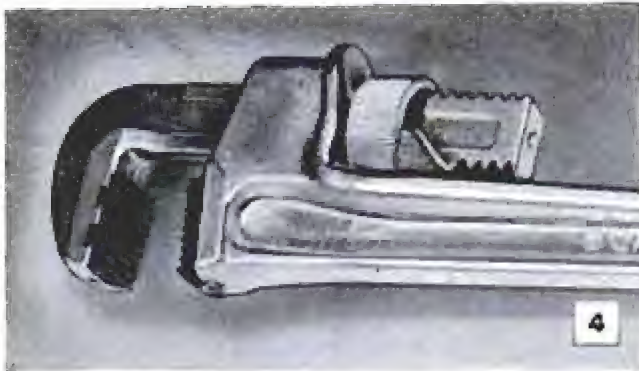
Thor Power Tool Co., Prudential Plaza, Chicago 1



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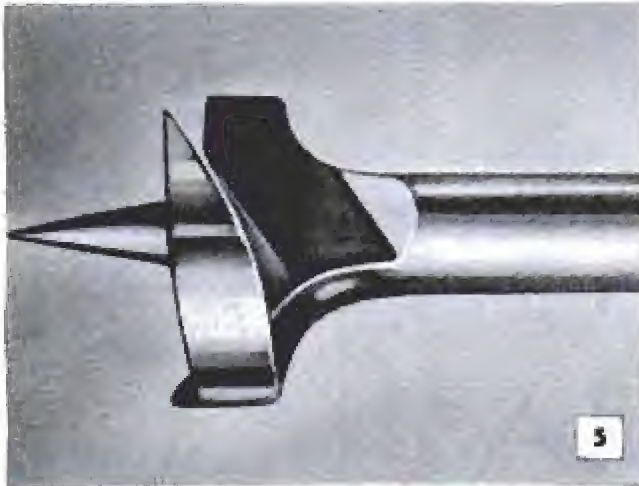
SHOPPING FOR TOOLS

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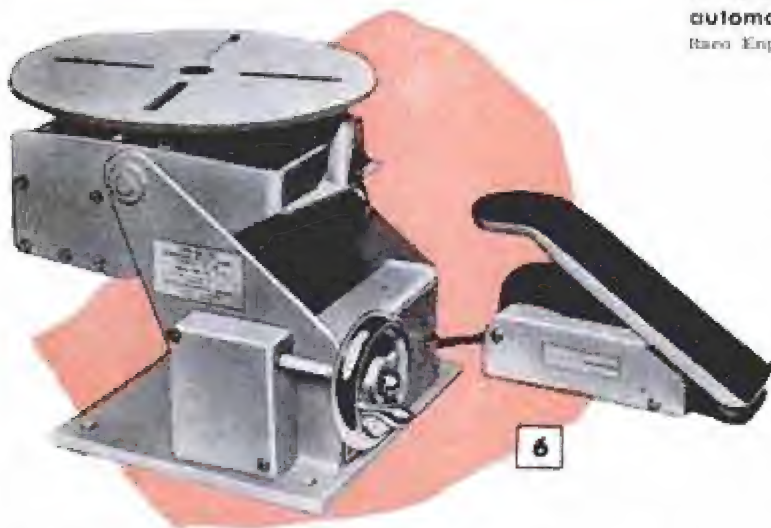
4

4. ALUMINUM PIPE WRENCH is 60 percent lighter than conventional pipe wrenches but is capable of same working loads due to use of high-strength aluminum alloys for all parts except hardened-steel jaws. Sparkproof beryllium-copper jaws are available. Made in 6 sizes from 10 to 48 in. over-all length
Schick Products, Inc., P.O. Box 867, Belmont, Calif.



5

5. POWER BITS for boring holes in wood, plastic and laminates from $\frac{3}{8}$ to 1 in. are designed for high-speed work when used with $\frac{1}{4}$ -in. and larger portable electric drills. Holes in all sizes are exceptionally smooth; no scoring due to clogging with chips. Brad point maintains stability and accuracy at high speeds
Stanley Tools, 111 Elm St., New Britain, Conn.



6

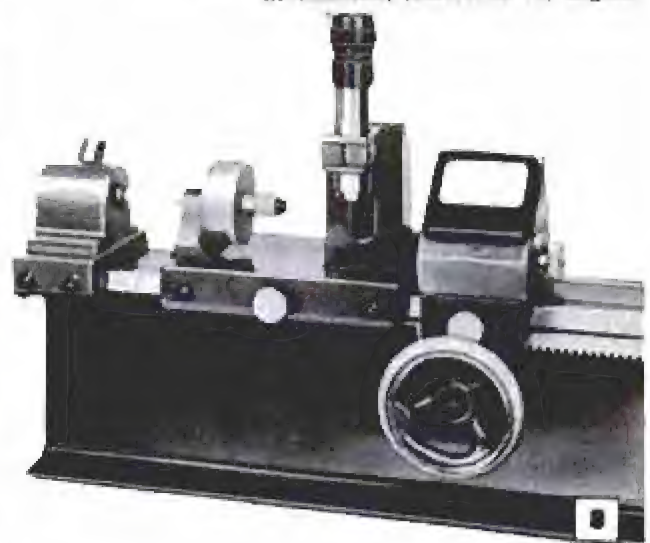
6. POSITIONER is adaptable to either manual or automatic welding. Will handle fabrications weighing up to 100 lb. The 12-in.-dia. turntable is fitted with a manual tilting device. Five speed ranges are available, 0 to 1.41 for manual welding, 0 to 10.5 for automatic. It is available with foot-control switch
Raco Engineering Service, 2116 Chestnut Ave., Alhambra, Calif.

7. TORQUE WASHER prevents a carriage bolt from turning in wood. Fits over the square section beneath the head of the carriage bolt and when bolt is tightened the lugs embed themselves in wood. Bolt cannot turn clockwise or counterclockwise. Washers are available in several sizes
Frank L. Robinson Co., Latham Square Bldg., Oakland 12, Calif.

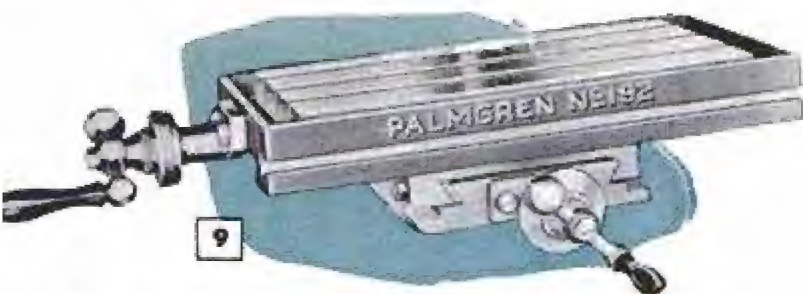
8. MEASURING MACHINE consists of a fixed saddle with measuring anvil, a micrometer-spindle slide and a manually operated support which is connected electrically to fixed saddle. Can be set up to take measurements within close limits internally and externally on large parts
Rupert & Co., Ltd., Chapel St., Stockport Rd., Levenshulme, Manchester 19, England



7



8



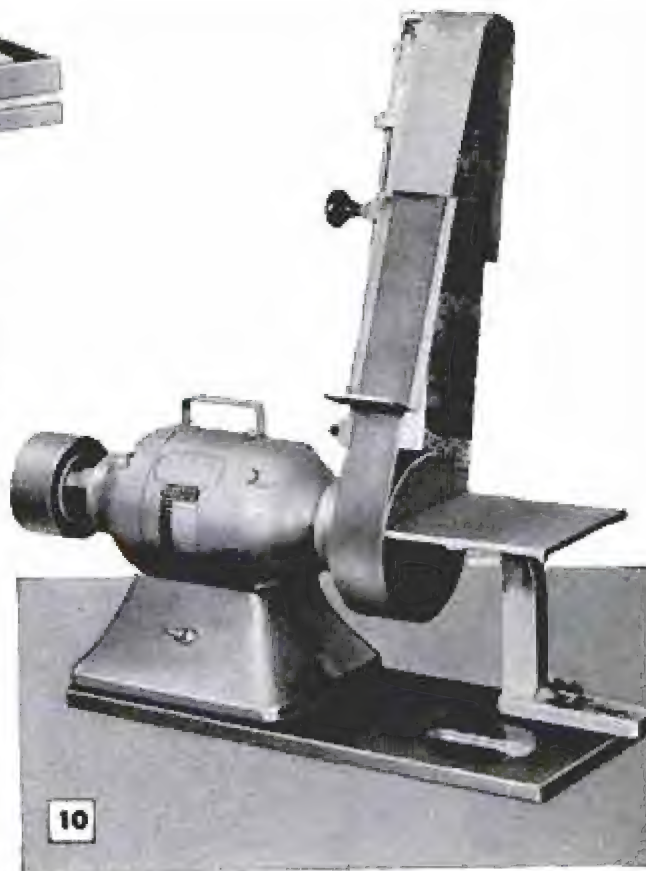
9

9. CROSS-SLIDE MILLING TABLE converts a drill press into a milling machine. Table has longitudinal travel of 11 in. and an infeed, or crossfeed, of $6\frac{1}{2}$ in. It is 18 in. long and $9\frac{1}{2}$ in. wide. Has center keyway and two T-slots. Extra T-slot on side of table can be used to make angle plate. Weighs 133 lb.

Chicago Tool & Engineering Co.,
8383 South Chicago Ave., Chicago 17

10. GRINDING AND DEBURRING MACHINE can be set up to perform several operations. Abrasive-belt extensions can be mounted on both sides of motor for roughing and finishing in one handling of material. Or machine can be set up as pictured, with one abrasive belt, contact wheel and tilting table

Curtis Machine Div., The Carborundum Co., Jamestown, N. Y.



10

11. ALUMINUM SNIPS feature replaceable steel blades and are lightweight, reducing hand fatigue. Fingerrips are designed to give maximum leverage and protection to operator's hands. Snips are 14 in. long with a length of cut of $3\frac{1}{4}$ in. Cut 22-ga. sheet steel and somewhat heavier gauges in softer metals

Anderson Tool & Mfg. Co., 3454 N. Kostner Ave., Chicago 41



11

12. LIGHT-STAPLE GUN takes $1/4$ and $5/16$ -in. staples. It's made for those light-nailing, or stapling, jobs such as fastening upholstery materials, closet linings, garbage-bag holders, shelving ruffles, etc. Has built-in lifter for extracting staples

Arrow Fastener Co., Inc., 1 Junius St.,
Brooklyn 12, N. Y.

13. LIQUID "LOCKWASHER" prevents nuts and screws from loosening on lawn mowers, household appliances and small power tools. Drop forms a bond that locks metal to metal, shake-proofs nuts and capscrews subjected to quite severe vibration

American Sealants Co.,
103 Woodbine St., Hartford 6, Conn.

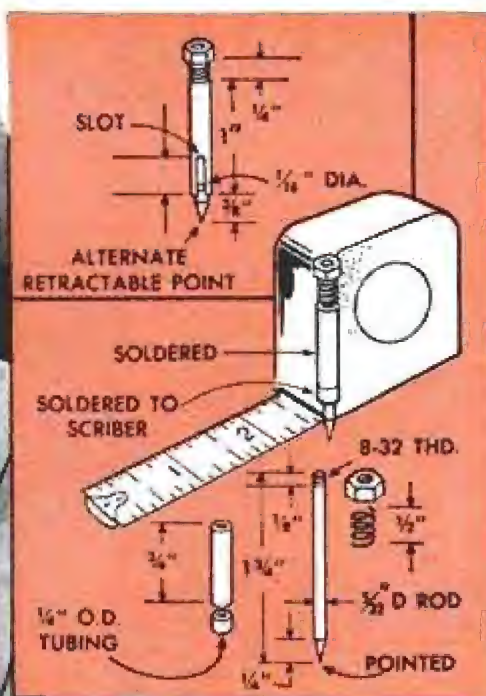


12



13

Modified Measuring Tape Has "Self Marking" Feature



Your steel measuring tape becomes even more useful when this "self marking" feature is added. The marker itself is a 1 3/4-in. length of 5/32-in. drill rod with a point ground on one end. Threads are cut on the opposite end to receive an 8-32 nut. Just above the point of the marker a short length of 1/4-in. copper tubing is soldered to act as a stop when the marker is fitted in a slightly longer piece of the tubing that is soldered to the corner of the tape case as indicated. A spring to hold up the marker is a length of spring of the type used to hang curtains.

Trouser-Cuff Nail "Pockets"

When driving many nails from a kneeling position, make extra-deep cuffs on your trousers for nail aprons. Large safety pins will hold the cuffs temporarily.

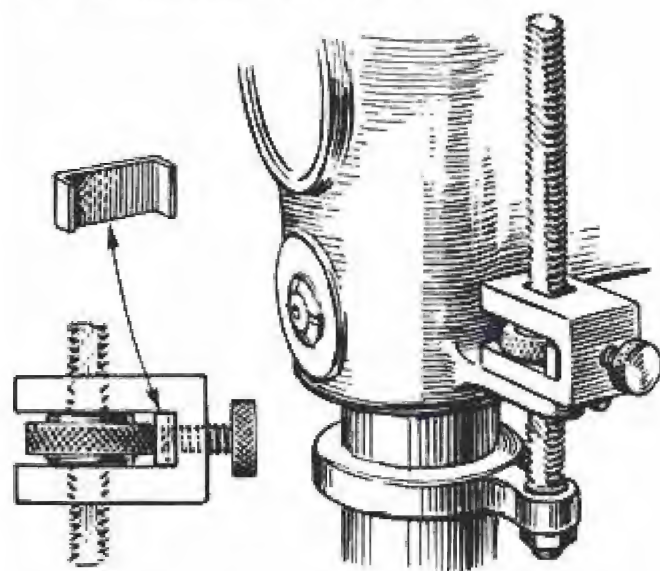
S. Clark, East Bradenton, Fla.

It is stretched so it becomes a compression-type spring, holding up the marker when it is assembled in the tube. The upper detail shows an alternate marker having a slotted tube which permits the sharp point to retract fully into the lower end.

Russell J. Love, San Francisco, Calif.

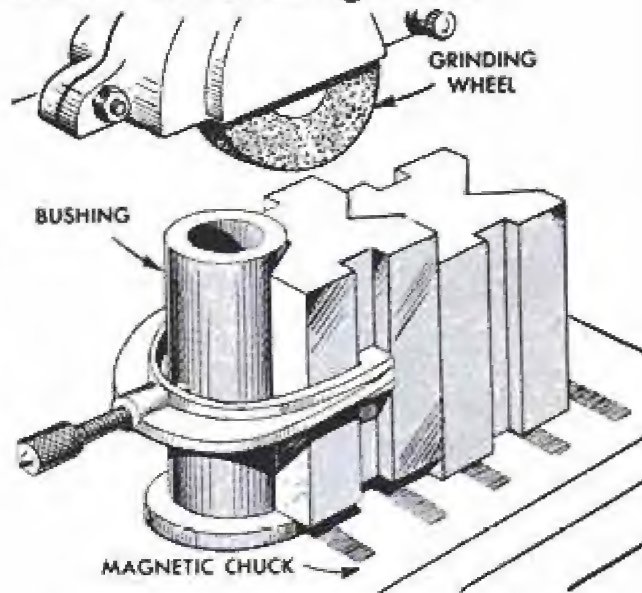
24 CALIFORNIA ST.

Adjustable Stop on Drill Press Modified for Easier Action

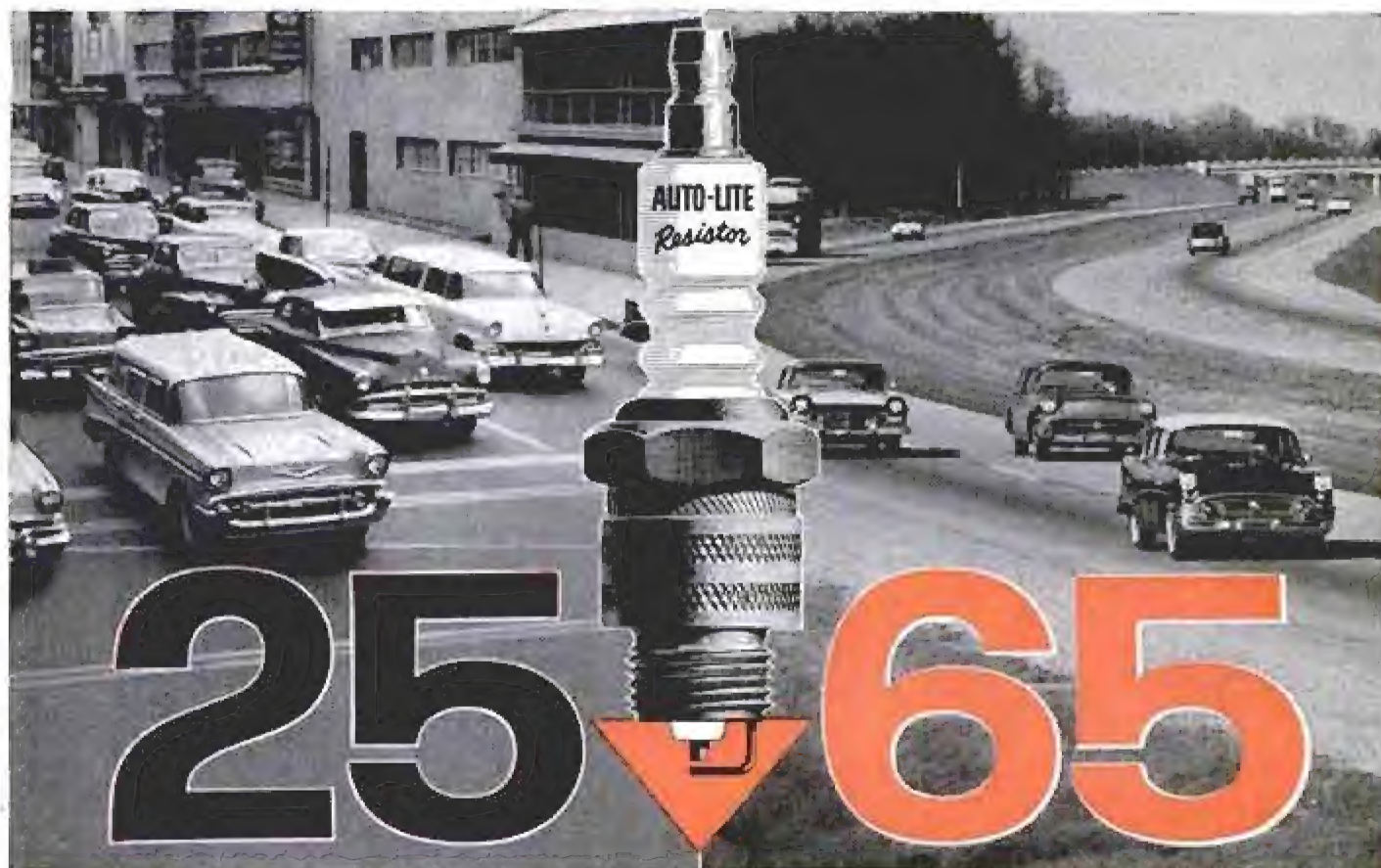


Because the two knurled nuts on the depth stop of his drill press often became jammed and difficult to turn, one man modified the stop as indicated. One nut is removed and replaced with a U-shaped block that slides over the depth stop. A knurled thumbscrew in the block bears against a U-shaped piece of metal that locks the knurled nut.

V-Block on Magnetic Chuck Adds Extra Holding Power



To reduce the chances of smaller workpieces being knocked over by the grinding wheel, or breaking the wheel, on a surface grinder, remember that larger items are held more firmly on a magnetic chuck than small ones. Clamp the work to a V-block which is held more firmly. On work with a flange, clamp the work to one block, and use a second block as a backup.



IN TOWN TRAFFIC . . . some spark plugs, designed for high speeds, become fouled and cause misfiring and loss of power when driven at low speeds.

ON THE HIGHWAY . . . some spark plugs, designed for low speeds, misfire causing power loss and invite destructive pre-ignition when driven at high speeds. Why gamble when . . .

Auto-Lite Resistor Spark Plugs with **POWER TIP** "Fire Up" your engine* at all speeds!



If you drive at both town-traffic and highway speeds, here's why you should use Power Tip . . . the first spark plug ignition-engineered for today's engines and today's driving.

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away *clean*. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it stays cooler to effectively *check* power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite . . . the *only* spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at *all speeds*.

*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all these cars—Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Edsel, Ford, Hudson, Imperial, Lincoln, Mercury, Oldsmobile, Nash, Packard, Plymouth, Pontiac, Rambler, Studebaker.

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Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at *all speeds*.

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Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Marine, Small-Engine, Transport, and Aircraft.

LOOK, MISTER!
No Hands



It's Self-Gripping

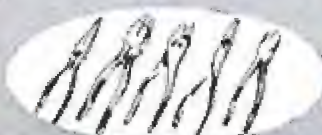
CHAN NEL LOCK
No. 410

HEAVY-DUTY PLIER

How's this for gripping power? You won't know your own strength 'til you grab hold with this heavy-duty self-gripping plier. The Channellock No. 410 HEAVY-DUTY is actually a combination plier-wrench... and it will get into tight places you can't reach with a pipe wrench. A mighty handy, multi-purpose tool with four jaw adjustments up to 1-1/8".

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CHANNELLOCK No. 410 HEAVY-DUTY PLIER

BE SURE IT'S
A GENUINE
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LOOK FOR THE
TRADEMARK
ON THE HANDLE

CHAMPION DeARMENT TOOL COMPANY
MEADVILLE, PENNSYLVANIA

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Paint Peels From Putty

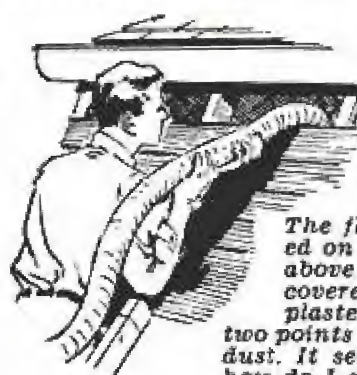
Q—My home is about one year old and has steel casement sash throughout. Lately I have noticed that paint is peeling from the putty in two places on one of the sashes. Moisture appears to be working out from under the paint in the immediate area and the putty appears to be soft. The defect

appears only on the lower horizontal members of the sashes. What is the cause of this failure of the putty?—S. H., Del.

A—It is difficult to say with certainty, as there are a number of probable causes. The sashes were undoubtedly glazed after installation and it is quite possible that the one affected was spotted with oil at those points where failure of the putty is occurring or that water or ice was present at the time this particular sash was glazed. One or the other of these, it would seem, is the most likely cause. At any rate, the putty has failed and must be replaced. This should be done immediately. After the putty has been removed from the affected areas, clean thoroughly with a solvent and allow to dry. Then apply a coat of paint to the sash at those points where putty has been removed. This must be allowed to dry thoroughly. Then apply new putty, taking care to force it into contact with the old and also into close contact with the glass pane. Allow the new putty to harden before painting.

Sawdust Insulation

Q—I have just learned that the walls of the older home I recently purchased are insulated with sawdust. The house has a full basement with sills at the grade level.



The floor joists are supported on a ribband about 30 in. above the sills. Studs are covered with wood lath and plaster. I removed this at two points and out came the sawdust. It seemed to be dry, but—how do I get rid of it?—D. S., Ia.

A—Sawdust is not recommended as insulation due to the danger of insect infestation, moisture condensation and also the fact that it tends to settle and pack tightly, thus losing much of its insulating properties. But if it is dry as you say, why worry, at least at the present? If no trouble

(Continued to page 216)

Now! New wood finishing beauty for your wood paneling and furniture

New Weldwood Satinlac Lightener and new, improved Weldwood Satinlac give you easier, more lustrous natural wood finishes than ever before possible.



To retain the true native wood color, use new Weldwood Satinlac Lightener as a first coat on unfinished wood.

- makes "invisible" protection possible, prevents the darkening or "wetting" look that usually occurs when conventional finishes are applied to virgin wood.
- preserves the color of freshly cut and sanded wood, and at the same time prepares the surface for subsequent luster-giving coats of Weldwood Satinlac.



For special effects, use Weldwood Firzite.

- **WHITE** for blond or pickled effects with a clear "woody" finish. Also as prime coat under paint—prevents checking, grain raise.
- **CLEAR** as a pre-sealer to assure even absorption of stain, prevent wild grain in softwood growth. Also, a perfect stain when tinted with colors-in-oil.



To get glowing, soft-sheen woodbeauty, use new, improved Weldwood Satinlac.

- brings out, preserves wood's natural beauty without the "built up" look of ordinary finishes; resists alcohol, water staining.
- resists fading or yellowing with age; new Satinlac contains an exclusive Ultra-violet ray screen that inhibits the effect of light on the wood's color.
- goes farther, works easier, has less odor; new Satinlac's improved formula contains twice as much solids as formerly; greatly superior solvents give better flow.

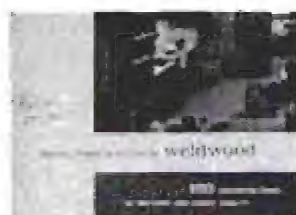


CHOOSE THE FINISH YOU WANT from this helpful display with 27 real wood samples, now at leading paint, hardware, and lumber dealers'. Shows you many of the beautiful wood finish effects you can obtain with new Weldwood Wood Finishes.

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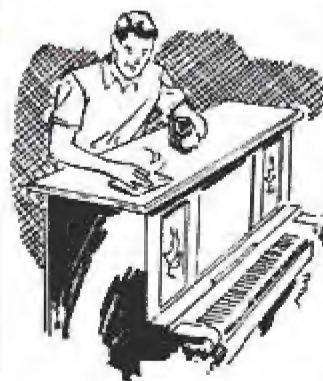
(Continued from page 214)

is observable, such as peeling of the paint on the exterior walls, or loose, damp plaster on those plastered areas in the basement then in your case the sawdust may be serving a better purpose in the walls than out of them. However, even though the sawdust insulation may have been in place for some years, one cannot rule out the possibility of insects, such as termites and powder-post beetles (the latter are a lesser possibility), invading the walls. If the sawdust remains dry, then this would seem to be the principal danger of future trouble. It should be a comparatively simple job to remove the sawdust at any time and replace it at a nominal cost with a pour-type insulating material.

Refinishing Old Piano

Q—I have an old piano I'd like to refinish. I don't know what kind of wood it is, but some parts are veneered as veneer is chipped at the corners. There is a lot of carving to be refinished. Finish is badly checked and the whole thing is coated with dust and grime. Can you tell me where and how to begin?

—L. E., N. Y.

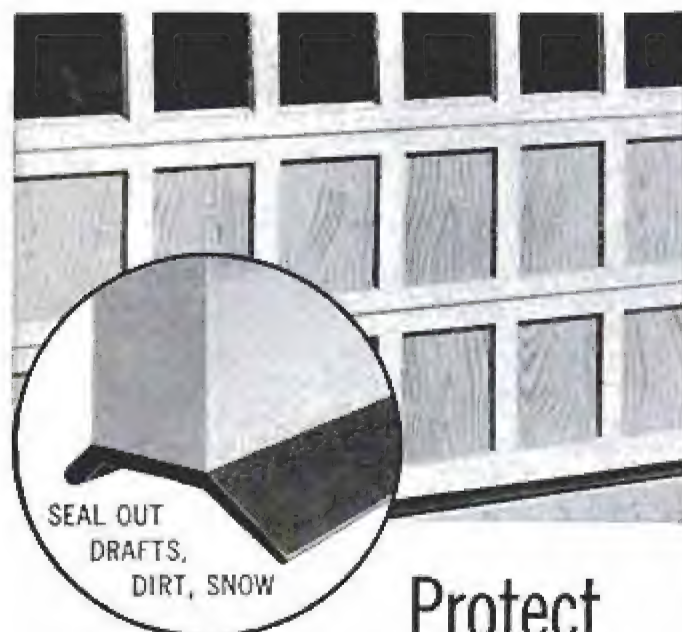


A—Many old pianos were made from several woods, certain of the exterior parts from woods that carve easily such as gumwood, mahogany and tulipwood. Flat and curved parts usually are built up from several thicknesses of softwood and veneered with walnut, mahogany or rosewood, the latter being a favorite veneer with some makers of old pianos. As the first step, experienced refinishers usually build a mild soapsuds in soft water and give the whole thing a thorough washing, taking care not to wet the surfaces unduly. This removes the dust and grime. Then the flat surfaces are sanded lightly and the turnings or carvings are gone over with a stiff-bristle brush or steel wool. This cuts off the roughness and reduces the checks. Next, a paste is made using raw linseed oil, fine pumice stone and turpentine. This is applied to a small area at first, using a pad made by folding a soft cloth to several thicknesses. The area is then rubbed with a circular motion, a few drops of oil being added occasionally to prevent the pad from sticking. The rubbing is continued until the surface is smooth to fingertip touch. At this stage, if the first coats of the old finish are still in good condition, the grain of the wood will show quite clearly. It's at this point that refinishers of old pieces decide whether to continue the rubbing-down process or remove the old finish to the wood. If the rubbed-down finish is smooth to the touch and the grain shows the original "fire" and detail the refinisher continues the process he has started, working over the entire piece. On turnings and carvings a stiff-bristle brush or a gather of medium steel wool is used to apply the abrasive paste. All surfaces are wiped clean as the work progresses; the oil is never allowed to set on the finish. In this process no new finishing materials are applied. The process simply brightens the undercoats of the old finish, preserves it and also the desirable aged coloring, or patina, of the wood.

Painting Stone Foundation

Q—My basement walls are of natural stone and the inside surface is quite irregular. Both mortar and stones appear to be in good shape and I'd like to finish the walls in some way to make them more attractive. Will an ordinary paint adhere to the stones, or is there some special paint that must be used?—I. H., R. I.

A—By ordinary paint we assume you mean a house paint, either interior or exterior. Such paints are not suitable for application to stone, especially below grade. We hesitate to recommend painting or otherwise coating natural stone as the texture of a wall built from stone is attractive in itself. But if painting the walls is a part of your decorative scheme then we would recommend that you use a water-soluble masonry paint.



SEAL OUT
DRAFTS,
DIRT, SNOW

Protect costly garage doors with **StanStrip***

Now . . . for less than \$3.00 . . . in less than 10 minutes . . . you can put StanStrip on an 8-foot overhead garage door. And what a difference it makes!

The thick, rubber "pad" cushions the shock of closing . . . prevents damage to doors, spares the windows, ends the crash of closing.

And, just as important, the double lips of StanStrip flex to follow every irregularity in the floor . . . seal the opening completely against dust and dirt, rain and snow. Your garage stays cleaner, drier, warmer. Your car starts easier in winter.

And does it last! You just can't hurt StanStrip. The special rubber compound was developed from hundreds of formulas tested for this purpose. Stays flexible even in coldest weather. Get StanStrip now at hardware and building supply stores.



SEAL HOUSE DOORS, TOO

Ask for DraftTite* . . . an exclusive combination of silicone-treated wool-pile fibers and aluminum. It's the most effective house-door weatherstrip on the market.

*Trademark

The Standard Products Co.
LEXINGTON, KENTUCKY



FOR WATERPROOF GLUING

Completely waterproof two-component resorcin glue forms a bond stronger than the wood itself. Resists continuous outdoor exposure, cold and boiling water, moist and dry heat, mold and fungus, solvents, acids and alkalis. Unbeatable for boats, outdoor furniture, sports equipment. Comes in $\frac{1}{4}$ pint and pint cans.



FOR NO CLAMP GLUING

Regular or nonflammable cements that bond on contact. Strong, water-resistant and heat-resistant. Best you can use for plastic laminates, plywood wall panels, leather, linoleum, synthetic rubber, thin gauge metal and all dissimilar materials. Can sizes in pints and quarts.



FOR GENERAL WOOD GLUING

This powdered casein glue makes strong, water-resistant joints. Works fine on hard or soft woods and many other materials. Mixes easily in cold water and can be used anywhere, even in cold outdoor temperatures. Ideal for laminating beams . . . gluing tables and counter tops, sashes and doors, molding and fixtures. 1 and 5 pound can sizes.



Buy where you see
this emblem . . .

Borden's Products
FOR THE
HOME HANDYMAN

© Borden Co.

There's an
Elmer's Glue for
every job you do!



FOR HIGH SPEED GLUING

A modern, ready-to-use polyvinyl resin glue for general interior use. Perfect for gluing dowels, paneling, inlays, marquetry, cloth, paper and all porous materials. Fast setting, dries clear. Available in refillable plastic squeeze bottles, tubes and jars in a wide variety of sizes.



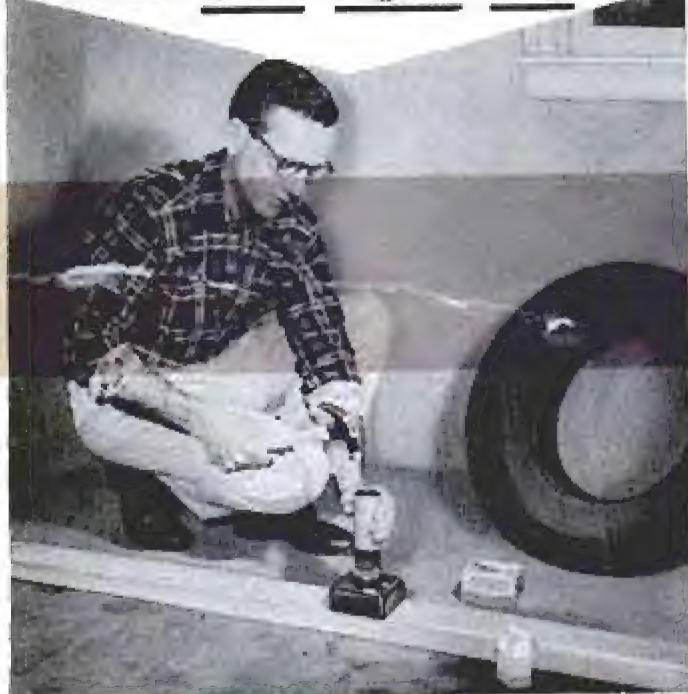
FOR STAINPROOF WOOD GLUING

Chemically neutral, this powdered urea resin glue does not stain acid woods like oak or mahogany. It is highly water resistant and mixes easily in cold water. The perfect glue for fine furniture panels, cabinet work, veneering . . . any job where a clean glue line is important. Available in 1 and 5 pound cans.

Borden Glues are available at hardware, variety, paint and lumber supply stores everywhere. For a free chart which shows the right glue to use for every job, print your name and address on a post card and mail to: Elmer's Glue Chart, The Borden Company, 350 Madison Avenue, New York 17, N. Y.

IF IT'S **Borden's** IT'S GOT TO BE GOOD!

Anchor wood or metal to concrete or steel with one light tap!



Anchoring 2 x 4 car stop to garage floor.

Remington Mighty-Mite® Stud Driver is a cost- and time-saving fastening tool with a hundred uses! One light hammer tap on firing pin permanently anchors furring strips, partition plates, electrical outlets to concrete or steel with special Remington Studs. Scientifically graded 22 caliber Power Loads furnish *exact* driving force needed. No pre-drilling. See your dealer today or send coupon for full details. **Only \$39.95**

Most dealers also have a tool-rental plan.

HERE'S HOW THE "MIGHTY-MITE" WORKS



UNSCREW upper assembly, drop a Remington "Power-Guide" Stud into barrel, insert chamber bushing and proper 22 caliber Power Load.



REPLACE handle-grip assembly, position tool and press firmly over work. Tap firing pin with a light hammer and the job's done!

Remington®

DUPONT
U.S. PAT. OFF.



Remington Arms Company, Inc.
Industrial Sales Division, Box PM-9
Bridgeport 2, Connecticut

Please send full information about the cost- and time-saving "Mighty-Mite" Stud Driver.

Name _____

Address _____

City _____ State _____

Festival of the Iron Men

(Continued from page 110)

up when those corncocks wouldn't catch fire. . . ." "Flew in from Montana yesterday. . . ." "Chain drive is all right going up, but coming down the other side the chain flies off. . . ." "Hauled water for Grandpa Beane at thrashin' time, and I bet I never forget the handle of that bucket. . . ." "Paid \$1200 for it, and the farmer tried to get still more. . . ." "That Russell 20-60 couldn't pull a bushel of manure. . . ."

Many of these now-shaky old threshermen can't remember anything that happened last week, but will never forget something that happened 60 years ago.

The people, of course, are even more interesting than the steamers. Dressed-up city dwellers look bewildered. Farm folk greet the old machines like long-lost friends. Over there strolls a blanket-clad family of Indians from the nearby Tama reservation. Here is a group of somber Mennonites, dressed in black from hats to boots, sunbonnets to high-laced shoes.

At noon you drift toward one of the big church tents, "The Old Threshers' Dining Hall." Inside you get a true threshers' meal, a tray piled high with fried chicken and a dozen other home-cooked foods, topped with a generous slab of mince pie. Despite the low price of the meal, the church will net \$2000 during the reunion.

Later you wander over to the grandstand for the annual "Cavalcade of Power" around the racetrack. There's standing room only as the parade begins. Each engine jerks down the track under its own power, sparks flying, and gives a triumphant "toot toot" as it passes the reviewing stand. It's an unwritten rule—but a rule seldom broken—that the honor of driving the engines goes to the indestructible iron men. And obviously this is one of the biggest moments of their long lives.

Perhaps the strangest vehicle in the parade is a 1916 LaCrosse, a combination of a buggy and a farm tractor. The driver sits in the buggy, which is pulled by the tractor. He controls the machine with reins, just as he would a horse. To go forward he lets out the lines. To reverse, he pulls back. To stop, he keeps the reins taut. A jerk on one rein will turn the gas tractor right or left.

Engine on a Teeterboard

One of the annual features of the parade is a demonstration of balancing skill on a teeterboard by Peter Bucher. It requires a feather touch on the throttle. First the

(Continued to page 220)

*These men chose
from 127 courses—
so can you!*



Pvt. Ted W. Gill
Comstock, Texas
Graduate,
Comstock High School

"I'm getting the engineering training I wanted, thanks to the Army's technical

training program for high school graduates. My Army Recruiter showed me all the different courses I could pick from. I chose Construction Surveying. The course was even better than I thought it would be. If you'd like to pick just the training you want, the Army sure offers you the best deal."

Pvt. Kenichi Isagawa
Maul, Territory of Hawaii
Graduate,
Baldwin High School



"If you're not going to college, the best way for a high school graduate to get just the training he wants is to enlist for the Army's technical training program. I picked a Metal-working course and learned the trade I wanted. Now I'm working right in my field. Only the Army offers you choice of schooling, so find out about it from your Army Recruiter."

Seniors—get all the details on how high school graduates can choose their technical training before enlistment from 127 modern courses. Mail this coupon for your free booklet today. Or for immediate counseling visit your local Army Recruiter. He's listed in the phone book and will give you all the facts—at no obligation!

THE ADJUTANT GENERAL
Department of the Army
Washington 25, D. C.
Attn: AGSN

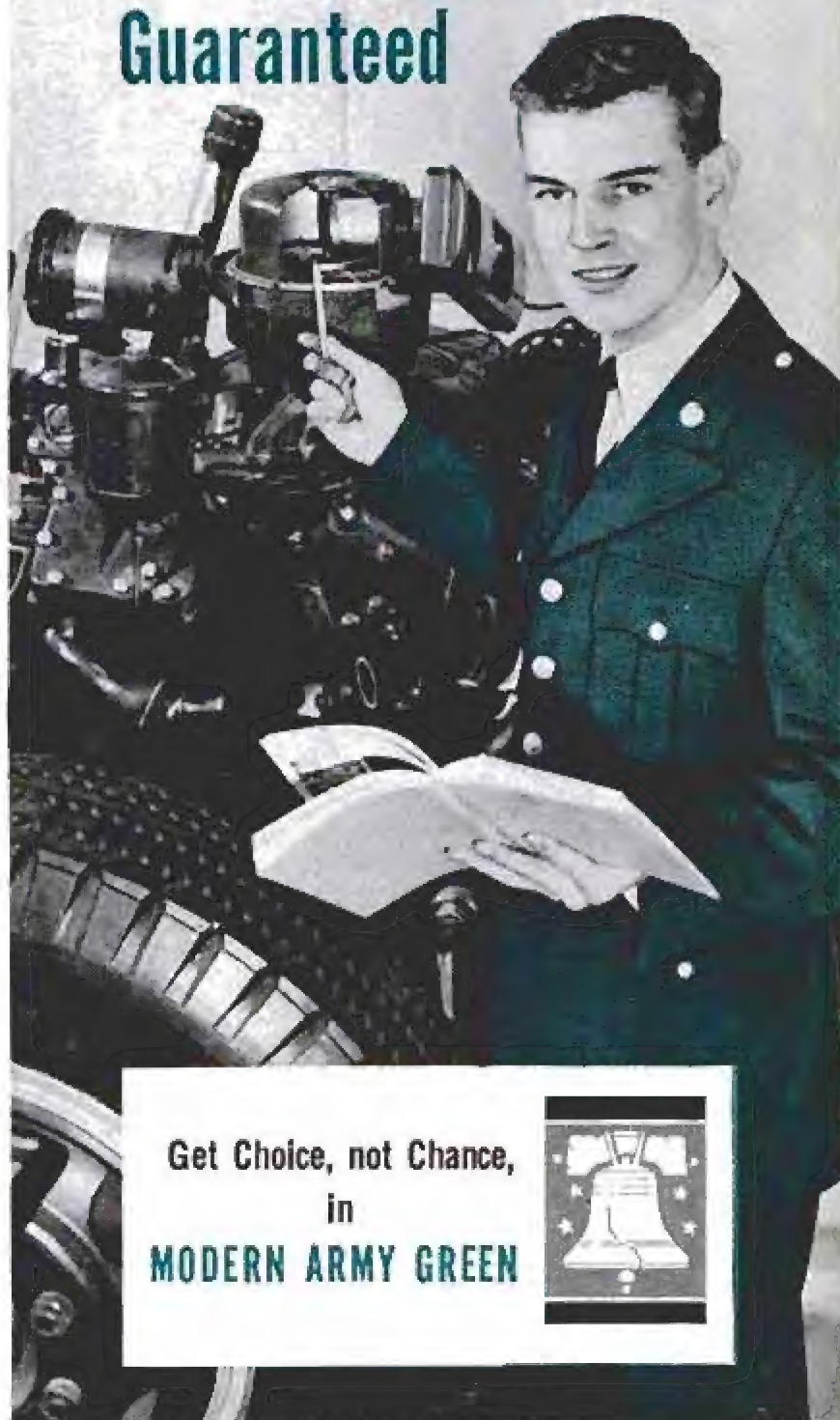
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Please send me the free Army booklet telling how high school graduates can choose their technical training before enlistment in Modern Army Green.

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*Ready for you!
America's Choicest Uniform!*

Only in MODERN ARMY GREEN is your Trade Schooling Guaranteed

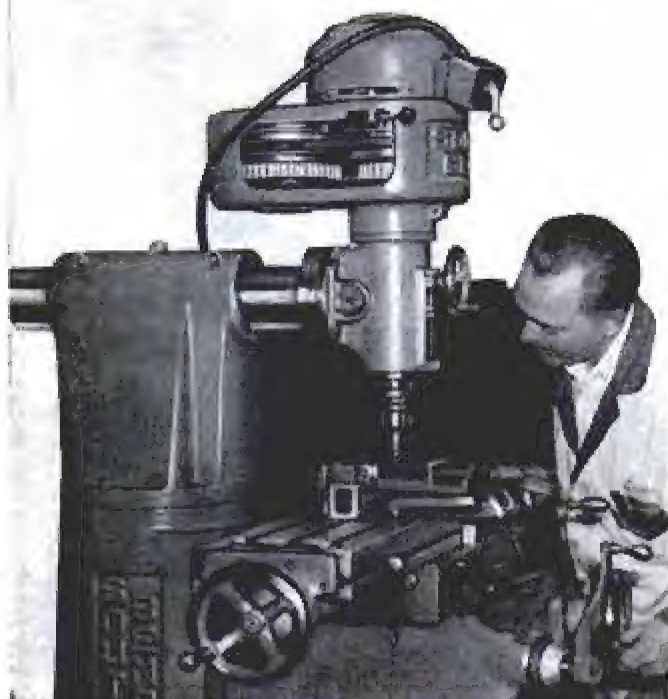


Get Choice, not Chance,
in
MODERN ARMY GREEN

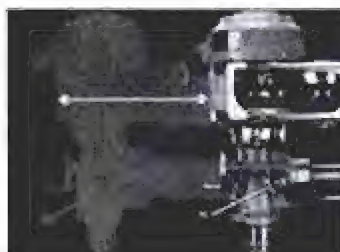


More Jobs, Faster Set-ups with

SOUTH BEND Vertical Spindle Milling Machine



- Mills—bores—drills—reams at any angle. Head rotates 360° vertically.
- Easy accessibility simplifies job set-ups and tooling changes.
- Fast—positive head indexing and table positioning. Easy-to-read dials.
- Rugged, heavy ribbed column, knee and table.
- 32" or 42" table with 20" or 30" travel.
- Prices start at \$1829 f.o.b. factory.



**In or Out Ram Travel
Without Re-setting
Head Angle**

Head swivels on ram flange. Ram has a large key sliding in a keyway with an adjustable tapered gib. No side play or canting when ram is moved—always in alignment.

WRITE for complete information on milling machines. Also lathes, turret lathes, shapers, drill presses and pedestal grinders.

SOUTH BEND LATHE
SOUTH BEND 22, INDIANA
Building Better Tools Since 1906



Up to 24
months to pay.

huge teeterboard is dragged onto the track and placed across a 10 by 10-inch timber. Out comes Bucher in his nine-ton behemoth. He runs the engine up the board and stops, just a mite short the first time. He backs off and tries again. If he overshoots by so much as an inch, 300 gallons of water will go sloshing forward in the boiler to carry him across the pivot point and plunging down the other side. This time he eases forward to precisely the right point, the board groans upward, and the huge engine stands balanced on the platform. The applause of the crowd is answered by a triumphant toot on the whistle.

And these drivers know when to pull a whistle cord. A politician approaches the microphone to make a speech, and immediately all the whistles blast forth to drown his voice. Finally he retires, defeated, and the victorious steamers head back toward the demonstration area.

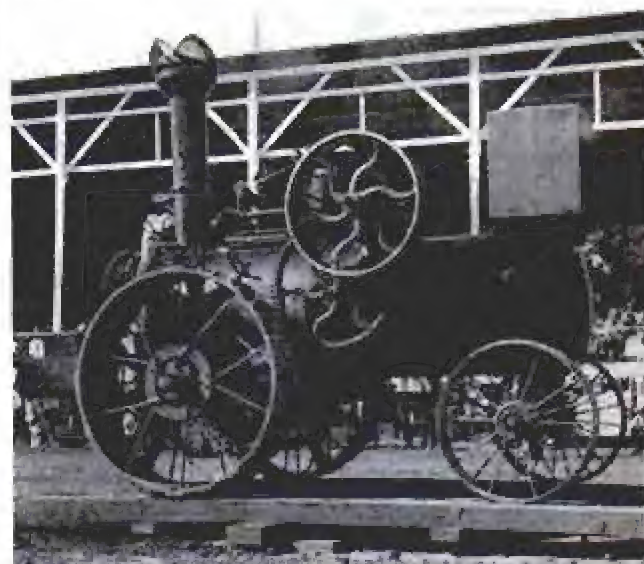
Old-Time Songs

As night falls you put away another tremendous thresher's dinner and wonder how the old-timers could stoke up on that much food, day after day. Then, hearing a mighty chorus from one of the buildings, you head inside. Gathered around an organ are hundreds of people singing the favorites of yesteryear. Later, along with the buffs, you listen to the tape-recorded wheezes, coughs, sputterings and toots of all the old engines. Some of these experts can tell the year and model of the engine from the sounds on the tape.

A. M. Wettach, one of the directors of the reunion and the professional photographer who took the pictures for this article, fills you in on what happens if it rains. "Hundreds of people gather in the buildings

(Continued to page 222)

In a display of driving skill, an old engineman balances a nine-ton behemoth on a teeterboard



Auto Care

starts with



Watch Walt Disney
Studios' ZORRO
every week on ABC-TV



Auto Care can prevent costly engine repair!

If the spark plugs in your car have gone 10,000 miles, they're due for a change. A new set of AC Hot Tip Spark Plugs can start you out again with like-new performance. That's because AC's exclusive Hot Tip

burns away carbon and oil deposits, keeps them clean-burning to assure efficient fuel combustion.

ACs are factory-installed on more new cars than any other make. Have an AC dealer install a new set in your car. Remember — Auto Care starts with AC.

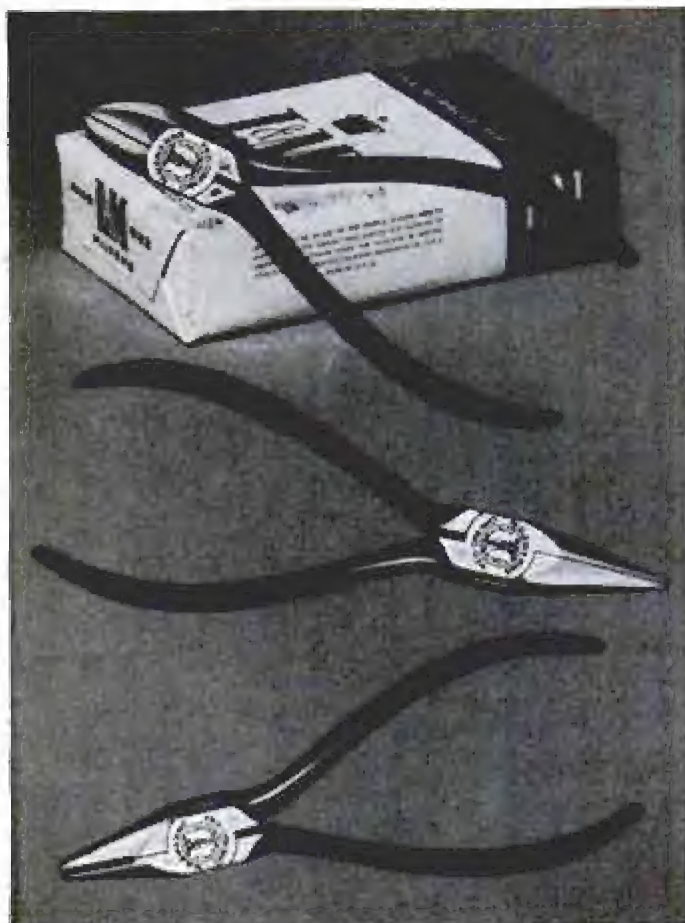
AC SPARK PLUG  THE ELECTRONICS DIVISION OF GENERAL MOTORS

Sparky Says:

"GET A NEW SET EVERY 10,000 MILES!"



NEW midget pliers added to KLEIN line



Hardly larger than a package of your favorite cigarettes, these new Klein Midget Pliers will simplify many of those small jobs where space is confined.

Midgets in size but giants in performance, they solve major problems when wiring up electronic assemblies; making model trains, airplanes, automobiles, or in any extremely small or confined work.

These new midgets are additions to the famous Klein line of high-quality pliers that are backed by over a century of manufacturing experience. See your hardware dealer.

No. 257-4 Oblique Cutting Plier	Size 4 in.
321-4 1/2 Long Nose Plier	4 1/2 in.
322-4 1/2 (Without Knurl)	4 1/2 in.
224-4 1/2 End Cutting Plier	4 1/2 in.



Free Bulletin on Klein Pliers

Bulletin 758 lists the many various pliers in the Klein line. A copy is yours for the asking. Write for it today.

Mathias KLEIN & Sons
Established 1857
7200 McCORMICK ROAD • CHICAGO 4, ILLINOIS



and tents to sing songs or just plain visit. It's about like it was of a rainy day on the farm, when the neighbors came over to help with a small job and hung around till chore time."

Now another big reunion day is over. Gradually the crowd files off into the darkness, some going home, others to motels and hotels (this is just a stop to them as they make the reunion circuit), still others to tents where they can sleep within earshot of their beloved engines.

Ahead as you pass through the gate is the same farm family you followed this morning. The old man's bandanna is soot-stained now, and he isn't standing quite as straight. His voice quavers a little as he talks about tomorrow's parade.

In many of these old men of iron, you realize, the fires are burning low. These old-timers, both men and machines, have been passed by in a new world of satellites and jangled nerves. But hundreds of thousands of ordinary folk feel nostalgia for the old-time steamer and the men it bred.

It's a feeling you can't explain to anyone else. You just sense it as you climb into your car. In the distance, some gnarled hand pulls the whistle cord for a final good-night blast, and you can't help answering with a toot of your car horn. ★ ★ ★

Rust-Resistant Wheat of Future Developed by Atomic Scientists

Atomic-energy scientists at Brookhaven National Laboratory, by first developing possible future wheat-rust diseases, have created wheat seeds able to resist the types of rust that could attack wheat for the next 100 years.

Do You Know This Old-Timer?

(answer to quiz, page 22)



1917 Reo Flying Cloud

(4-cylinder)

Change For The Better Change To V-M STEREO!



V-M
'Stere-O-Matic'
Model 1201

**NOW . . . TRANSCRIPTION-TURNTABLE
PERFORMANCE AT A POPULAR PRICE!
The All-New V-M 'Stere-O-Matic'®
4-Speed Stereo Record Changer**

- NEW CONVENIENCE!
- NEW VERSATILITY!
- NEW FEATURES!

Your high-fidelity system begins with your record changer. This is the one automatic 4-speed changer that matches all other changers feature for feature *and then some!* The all-new V-M Model 1201 comes wired for stereo with *stereo-cartridge* installed! Complete with dual output jacks and stereo/monaural switch.

SEE IT! COMPARE IT! TEST IT!

Model 1201 . . . \$50.00* Model 1202 . . . \$50.00*

*Slightly higher in the West.

**BEFORE YOU BUY ANY RECORD CHANGER —
BE SURE TO TEST V-M!**

See Your Nearest V-M Dealer TODAY!

the  of Music®

V-M CORPORATION • BENTON HARBOR, MICHIGAN

**Here's What Makes The 'Stere-O-Matic'
So Completely Dependable . . .**

RUMBLE: — 48 db for 120 cycle rumble when tested on XLP414 test record (recorded velocity approximately 3.4 cm/sec. at 1,000 cycles.)

WOW AND FLUTTER: ¼ RMS.

TURNABLE: Balanced to assure constant speed. Spindle bearing area centerless ground to reduce frictional drag.

MOTOR SPEED: Constant, positive for permanent true pitch.

TONE ARM: Resonance-free. Easily adjustable for any cartridge weight. Compensated to eliminate variation from bottom-to-top of record stack. Jewel-type anti-friction. Stereo cartridge installed. Will accept all popular stereo or monaural cartridges *without* alteration.

TRACKING ANGLE: Variation reduced to a maximum of 2°

AUTOMATIC SHUT-OFF: Unit shuts off automatically after last record plays.

RECORD INTERMIX: Will intermix 10" and 12" records of same speed. V-M "45" spindle fits easily over Tri-O-Matic spindle for 45 rpm records.

ELECTRICAL SPECIFICATIONS: 110-120 V; 60 cycles A.C. Special voltages and frequencies upon request.

ALSO AVAILABLE: Model 1202 with four-pole motor and plug-in head for GE and other magnetic stereo and monaural cartridges. All V-M models available with matching metal base-pan or pre-cut mounting board.

WORLD FAMOUS FOR THE FINEST IN TAPE RECORDERS, PHONOGRAPHS AND RECORD CHANGERS.

How to select a paintbrush

A good brush performs better... wears longer... saves you money



Check these points when buying your next paintbrush.

First, look for a full stock of bristles in a firm, strong setting (1). Avoid brushes with loose bristles. Then inspect the individual bristles closely (2). They should be finely tapered, with slightly curled

tips. Look again and be certain a generous portion (at least 10 to 20 per cent)



of the bristles have tips which are split or "flagged" (3).

Your final assurance of a brush which will give the best painting performance is bristles of varying lengths (4),

but with a high proportion of longer lengths.

If the brush you look at passes all these tests, it will have a greater



working and paint-holding capacity and eliminate excessive dipping. It will (5) release any type finish smoothly and evenly on any surface.

One short cut to selecting a good brush is to look for the black and yellow tag, signifying a brush with TYNEX nylon bristles

(6). Properly made paintbrushes with tapered bristles of improved Du Pont TYNEX nylon give you better painting performance. They pick up a full paint load at every dip and give velvet-smooth paint-out. With proper care, brushes with durable bristles of TYNEX clean easily... rinse thoroughly... are quickly ready for another job.



FREE—"How to Choose and Use a Paintbrush." This booklet tells how to paint walls, ceilings, trim, furniture, radiators and do other special jobs. Gives tips on the correct painting stroke, how to hold a paintbrush, how master painters dip their brushes, how they clean them. Tells what kind of paintbrush to use for each painting job. Write to E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Room 539 Du Pont Building, Wilmington 98, Delaware.



TYNEX is the registered trademark for Du Pont nylon bristles.



TYNEX
NYLON BRISTLES

BETTER THINGS FOR BETTER LIVING... THROUGH CHEMISTRY

Improve Your Wing Shooting

(Continued from page 149)

a lot of his effort gaining altitude. Once he levels off, his speed picks up and you have to allow more lead.

Of all the wing-shooting targets there's none trickier than the ruffed grouse. When you can bag this bird a fair portion of the time, you've arrived among wing shots. His flight is fast and he's an artist at getting trees between himself and your gun. Many a woodland wing shot has put a load of shot into a tree instead of the grouse that darted behind it. And in grouse hunting you have to expect the bird to take off with a roar. You need calm nerves and the ability to point your gun quickly. A light gun, especially a 20-gauge loaded with No. 7½ shot, is fine for grouse shooting.

Many wing shots insist, however, that the toughest bird of all is the dove, which has a fast erratic flight. Dove shooting is often open-country shooting. Hunters station themselves between fields where the birds fly to and from feeding or watering areas, and shoot at the birds as they pass. The pattern of shot should be tight, for this is a small bird and shot size No. 7½ or 8 will do well.

The confirmed waterfowl gunner braves all manner of weather. When he brings down a bird he feels considerable satisfaction, for shooting ducks calls for fine shooting. When you get a shot, take time to line up the gun behind the bird, move through him, pull the trigger as you get the right lead, and follow through. Get on your target early. Duck shooting should usually be done at 40 yards or less. Long shots often mean more cripples as well as fewer shots, for you simply frighten ducks out of the neighborhood. The 12-gauge shotgun is almost standard for duck shooting, although some gunners manage quite well with 16-gauge guns. No. 4 shot is probably the best.

But whatever the target, a little practice and study can go a long way toward providing a better day's wing shooting in the woods, field or blind. ★ ★ ★

Infrared Defense Weapon "Too Good" to Be Used

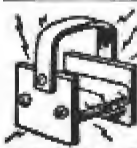
Army Signal Corps scientists are trying to reduce the sensitivity of an infrared-ray device which could detect the launching of a missile thousands of miles away. Because it is extremely sensitive, the device also could spot a bonfire on the other side of the world. However, in its present form, the detector couldn't distinguish between a missile and a bonfire.

KEEP YOUR WORKSHOP TOOLS SAFE AND ORDERLY



This 7-drawer machinist's chest has a place for every tool. Extra durable heavy gauge steel. Felt lined drawers protect delicate edges... operate easily. Size: 8½" x 13½" x 20¼". \$27.95 at leading hardware stores. Slightly higher west. Other home workshop models from \$1.25 up.

WATERLOO VALVE SPRING COMPRESSOR CO.
Waterloo, Iowa



GENUINE ALNICO MAGNETS

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL. Conduct interesting experiments. Hundreds of uses. Retrieve valuable steel items such as guns, tackle from fresh or salt water; tools from tanks & drains. **GUARANTEED.** Try any magnet one week. Money back if you are not well-pleased.

No. M-710 (Wt. 53 oz.) Has pull of 225 lbs. on steel block... \$18.00
No. M-625 (Wt. 70 oz.) Has pull of 125 lbs. on steel block... \$10.00
No. M-575 (Wt. 18 oz.) Has pull of 75 lbs. on steel block... \$7.00
No. M-500 (Wt. 13 oz.) Has pull of 50 lbs. on steel block... \$5.00
No. M-400 Kit of First Bars 5 Pairs (10 Magnets)... \$3.00
No. M-250 Kit of Round Rods 5 Pairs (10 Magnets)... \$2.50
No. M-47 Hot Pad Magnets, 10 for \$1.00... \$0.50 for \$4.87
No. M-35 Hobbyist assortment of 8 small magnets... \$1.50

Send M.O. or check. We pay postage. Sorry no C.O.D.'s.
MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.



DRAINS cellars, cisterns, wash tubs; \$7.95 IRRIGATES - CIRCULATES - SPRAYS

1,001 uses. Stainless shaft. Won't rust or clog! Use 1/4 HP motor or larger... 3/4 HP for up to 3000 GPH; 450 GPH 80' high; or 1800 GPH from 25' well. 1" inlet, 3/4" outlet. Coupling included free. \$7.95.
HEAVY DUTY BALL-BEARING PUMP. Up to 7,500 GPH; or 3,000 GPH from 25' well. 1 1/4" inlet; 1" outlet. \$12.95
Postpaid if cash with order. **MONEY BACK GUARANTEED**
Centrifugal and Gear Pumps in All Sizes
LABAWCO PUMPS, Belle Mead 7, New Jersey

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A jeweled, precision instrument—designed for modern cars. Full, indirect illumination. Sharp, clear letters. Silver or gold Celebrity models \$6.95, standard models \$5.45, illuminated \$6.45
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Write
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STOP

ENGINE STALLS-VAPOR LOCK-LOW MILEAGE

INSTALL A **MILESMASTER®**

FUEL PRESSURE REGULATOR



Let Milesmaster help you enjoy better, more economical motoring. Sold everywhere... only \$6.95, plus installation.

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You can buy a LUMINALL miracle paint for every purpose



1. Famous
Satin Luminall
The concentrated interior paint with bonus quart per gal.



2. Exterior
House Paint
Durable, high-gloss beauty for all wood exterior surfaces.



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For brick, concrete, masonry, asbestos shingles—all climates.



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SELECT ITEMS
OF INTEREST
TO YOU



4. Luminall
Satin Enamel
Applies like paint, dries flawlessly to hand-rubbed finish.



5. Alkyd Flat
Wall Enamel
Rich, smooth enamel that applies easily on all interiors.



6. Ready-To-Use
Luminall
Easiest paint to use on all interiors. Washable. Durable!



7. Alkyd Non-Fade
Trim Colors
Hard gloss for all wood or metal sash, doors, shutters.



8. Luminall Parth
& Floor Enamel
High gloss for all floors, inside or outside, heavy duty.



9. Concrete
Floor Paint
Quick-dry, tough finish for floors, patios. Easy to use!



10. Luminall
Ori-Rite Enamel
Interior & exterior luster for yachts, machinery, furniture.



11. Semi-Gloss
Wall Finish
Kitchen-bath-trim enamel to match alkyd flat colors.

Millions of happy users know Luminall Paints apply easier, look better, last longer, cost less per square foot. That's why they're called "Miracles"!



'HIS & HERS' PAINTING PACK

Great idea! Real color chips for her selection. Practical how-to-paint-it suggestions for him. A free Painting Pack.

Circle for color card
on above paints

1	2	3	
4	5	6	7
8	9	10	11

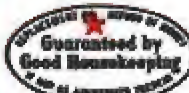
Luminall Paints, Dept. K, Chicago 9, Ill.

Please send free painting packs on items I have circled, with no obligation to me.

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Address _____

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LUMINALL PAINTS
Finest in Finishes



A-FRAME
MOUNTAIN CABIN

vacation cabin IDEAS



WEEKEND
BEACH COTTAGE

NEW full-color booklet shows 20 easy-to-build fir plywood cabins

HERE'S the perfect source of ideas for anyone planning to build a vacation cabin. Smart, modern designs by leading architects for cabins of every type and size, complete with pictures in natural settings, floor plans and building tips. Plans call for simple, straight-forward construction with light, strong fir plywood to save you time, money and trouble when you build.



complete plans
available for all
20 cabins

Send 10c to cover mailing costs to:

DOUGLAS FIR PLYWOOD ASSOCIATION
Dept. Tacoma 2, Wash. Offer good USA only)

Treasure Hunt in Navajo Land

(Continued from page 92)

tires is high. In the basin, however, you lower the pressure—or you are likely to be a long time getting any place, because you will become stuck in the sand. Truck transmissions are installed in automobiles. Seat belts are almost a must. And, when drifting snows obliterate roads in the winter, the cars are put away. Jeeps and half-tracks are necessary to get you there.

Before the oil boom came to their reservation, the Navajo Indians had a per capita income of only \$420 a year. There are about 80,000 Navajos, but already their average income has more than doubled.

"Water for the land is what we want," explained a Navajo. "Our people have wanted water for a long time, and now we may get it with oil money for irrigation. The reservation needs many other things—better roads, hospitals, schools."

Primitive Patterns Persist

There may be better Navajo homes and there may not. A good share of the Indians today still live in mud hogans with windows that have no panes, doorways that have no doors. But finer homes may not be desired by many Navajos who still follow the practice of abandoning their home after someone has died in it.

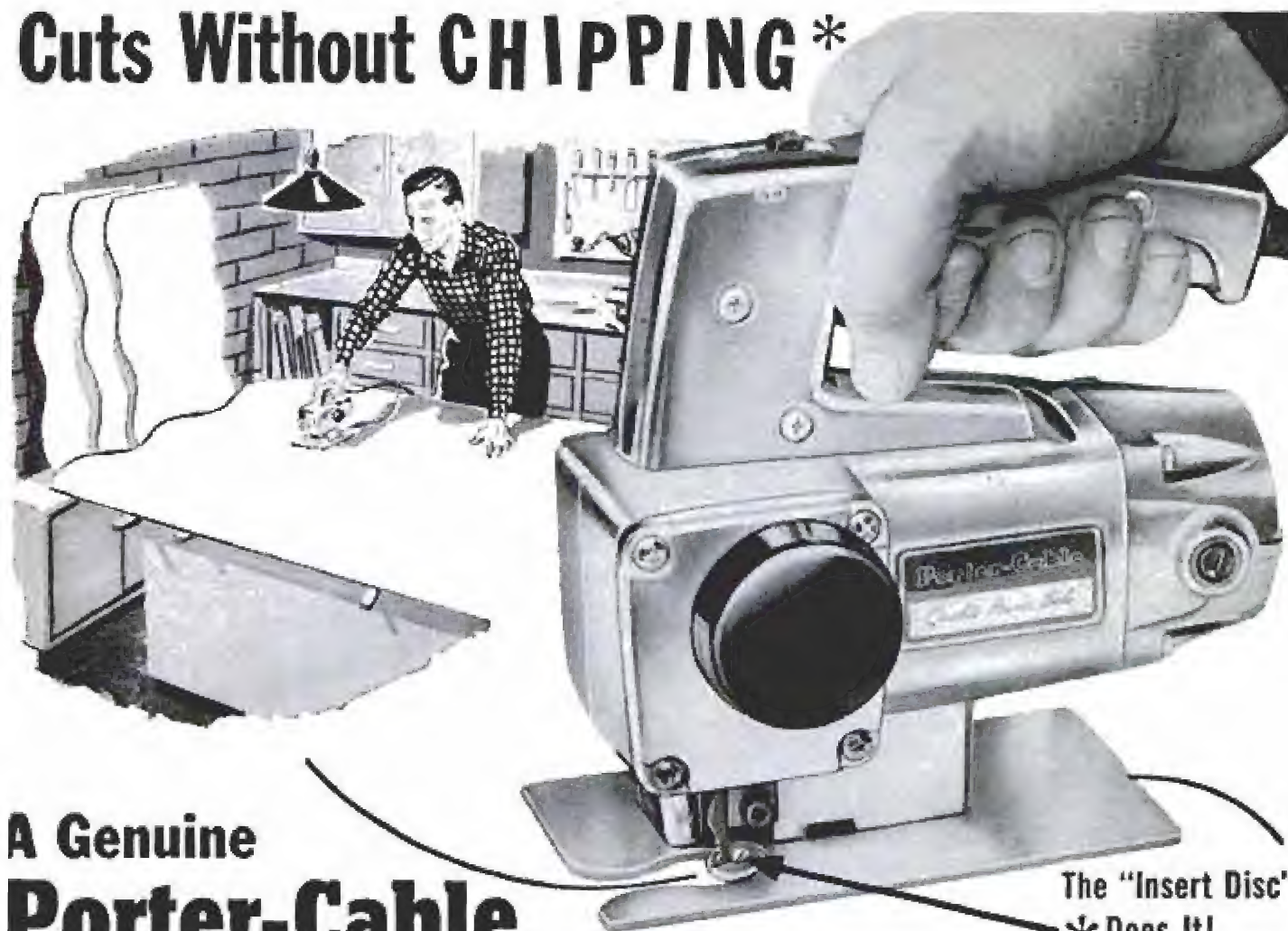
Farmington, N. Mex., is about 90 miles from the Aneth-Isamay. It has seen boom possibilities throughout the years with such varied activities as cattle raising, fruit growing, brick manufacturing and flour milling, but now, with oil flowing off in the distance, the boom has really arrived. Three years ago the population of Farmington was about 3500. Today, it is 15,000 and still climbing.

Commuting Is Real Problem

Many suburbanites think they spend quite a bit of time commuting. But commuting for oilmen in the basin is really on the rugged side. A typical foreman travels by car 175 miles per day, sometimes covers up to 300. And the traveling is lonely. Company cars are equipped with radios—but they are short-wave sets to keep in touch with their headquarters. Meeting a Navajo sheepherder is a welcome diversion. For the Navajo, meeting a tourist usually calls for the providing of detailed directions, because the chances are the tourist is lost.

Water is scarce. Wells are drilled for artesian water, but it's a standing joke that they "may produce only oil." Too often water must be trucked in. As for space, there is plenty of it. But, paradoxically, it is getting crowded with oil wells. ★ ★ ★

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A Genuine Porter-Cable Electric Hand Saw Loaded with Exclusive Features!

The "Insert Disc"
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1



2



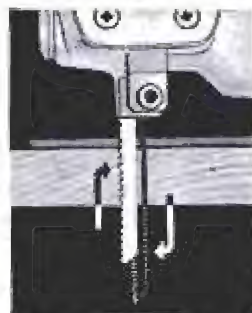
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The Porter-Cable #52 Hand Saw is the only saw with the patented insert disc which virtually eliminates chipping and insures a smooth, even cut on plywood, plastic laminates and other materials. It's the all-purpose saw for home or workshop—hack saw, scroll-saw, cross-cut saw, jig saw, keyhole saw, coping saw and rip saw.

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PORTER-CABLE MACHINE COMPANY
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The Big Switch to Stereo

(Continued from page 155)

reproduction. Motion in a vertical direction, however, is often severely limited. It is conceivable, therefore, that such cartridges would cause the stylus to gouge out the vertical portion of a recorded stereo signal and would ruin the record for future stereo purposes. Obviously, the use of a monaural cartridge for playing stereo records is not recommended, but this is only a minor disadvantage. Good monaural records are very plentiful and there seems to be little reason for anyone to invest in stereo discs unless stereo reproducing equipment is already on hand. The major problem, that of playing monaural records with stereo equipment, is satisfactorily resolved.

Looking Ahead

The switch to stereo is on! Already, only a few months after initial test demonstrations, a good selection of popular and classical stereo discs is on the market. Stereo cartridges, both ceramic and magnetic, can be purchased from distributors and most major manufacturers of hi-fi systems are including these in their new models. There is no doubt that the stereo record is here to stay.

The only question concerns the coexistence of stereo and monaural records. In view of stereo compatibility, it does not seem likely that record companies will publish the same selections in both stereo and monaural form for any length of time. It's a good bet, therefore, that in the future most new records will have STEREO on the label. But, by that time, most new phono systems will be able to handle these discs and most present hi-fi systems will have been converted for stereo reproduction. For stereo is, after all, one of the final and most dramatic steps toward true high fidelity.

HOW YOU CAN SWITCH TO STEREO

Your present phono system can serve as the nucleus for stereo. The additional requirements, as well as the methods employed for stereo in the home, will be discussed in next month's issue.

Vibrator for Driver Fatigue

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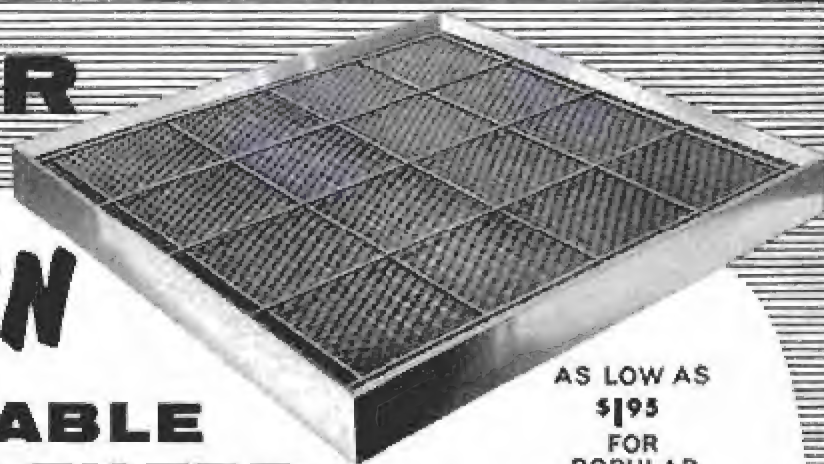
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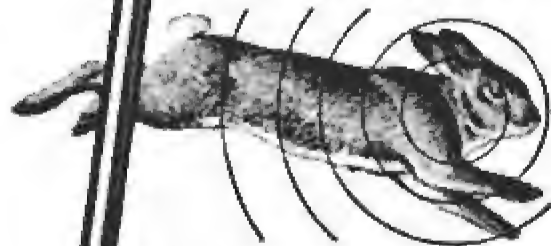
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How We'll Steer in Space

(Continued from page 139)

of power plants) is the problem of guiding a spaceship to its destination. Because we'll expend most of the ship's energy for the trip, little will remain to correct the guidance of the craft. Thus the initial "aim" of the craft must be extremely accurate; the more precise the guidance, the less fuel we'll waste.

Navigation Is Really Important

Let's look at the guidance problem for a moment. Guidance depends upon navigation, which is simply the art of going from point A to point B. On the earth's surface, both A and B (for example, New York and Chicago) are determined by two things: Latitude and longitude. When you navigate on earth, you simply determine the latitude and longitude of your vehicle (be it plane, ship or even car), and you can easily calculate the direction you must travel to arrive at the longitude and latitude of your point of destination. You can even become temporarily lost and still reach your destination, because A and B do not move with respect to each other.

Not so in space. Both A and B move because all planetary bodies move with respect to each other. Therefore your destination doesn't stand still. It's as though you were on a motor trip to Chicago, and Chicago kept moving all the time you were on the road.

In addition to this difficulty of a moving destination, travel in space occurs in three dimensions instead of the two (latitude and longitude) of your travel on earth. Actually, we can say that navigation in space is four-dimensional: Three space dimensions and one time dimension. Because the speed of planets is very great (67,000 miles per hour for earth, 54,000 for Mars and 79,000 for Venus), even a slight error in timing and speed may cause a complete miss. And if you miss, you very likely will wander through space forever.

Two Methods of Guidance

That's the problem. Now there are two methods we can use to guide a ship through space. We can give it precise speed and direction initially, as if it were shot from a gun. Or we can launch it with a reasonable degree of accuracy, and correct the course subsequently during the flight. The first is called the "ballistic" method. Hitting Mars ballistically is about as easy as shooting a swallow from half a mile away with an arrow.

The second method, known as midcourse

(Continued to page 232)

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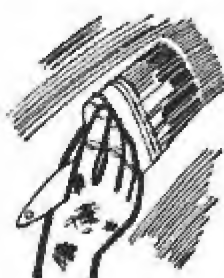
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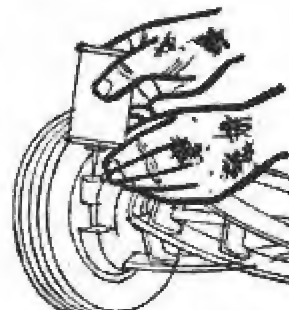


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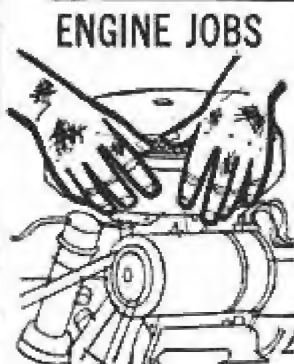
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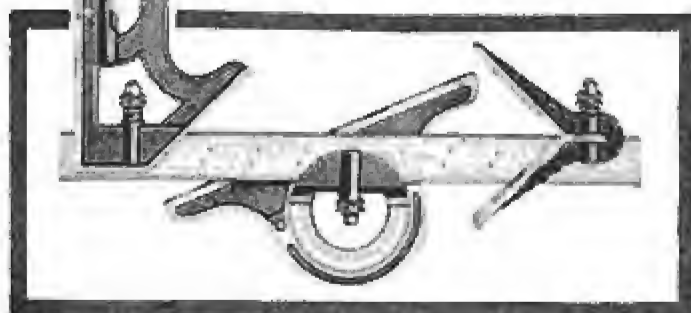


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guidance, is the most practical and also the most reliable because it allows for continuous correction of errors in the trajectory.

In order to use midcourse guidance, we must know certain facts: The ship's position, the ship's speed, the ship's direction of travel and the "future position" of the destination at the expected moment of arrival.

The last of these facts—the position of a planet at a given moment—we know very accurately from astronomical tables.

Open Field for Inventors

Two of the remaining facts—the ship's position and speed — can be determined from within the ship, or by observing the ship from the earth and relaying the information to the ship. (This is an excellent field for inventors who can offer sound and simple solutions.) One practical solution is shown in Figure 2. In this solution, the ship is tracked by radar on earth. Each radar impulse from earth triggers a "transponder" on the ship, which answers with a powerful radio impulse. The time interval between the radar pulse and its echo can be used to determine the distance of the ship from earth.

Using the same system, we can measure the speed of the ship. Have you ever waited for a train at a crossing and listened to its whistle? Just as the train passes, the sound seems to drop in pitch. This is known as the "Doppler effect." Here's what happens: Because the train is moving, you in effect are "running away" from the train's whistle and its sound waves. Therefore you receive fewer waves, and the pitch of the whistle seems to drop. The same phenomenon applies to radio waves. The frequency drops as the receiver moves away from the transmitter, and increases as it moves toward the transmitter. By measuring this change in frequency we can determine the ship's speed.

Three "Speed Fixes"

Actually, for a really accurate speed measurement we need three different "speed fixes" from three different radars on the earth's surface.

We can determine the ship's direction by measuring the angles as shown in Figure 2. One angle is the latitude of the transmitter itself. The other two show the azimuth and elevation with respect to the earth's surface.

Thus the radar-beacon system will yield three facts: The ship's distance, its direction and its speed.

Another method is for the crew of the ship itself to determine its position. All it

(Continued to page 234)



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needs is a "frame of reference." Such a method is shown in Figure 3. In this case we select the sun as the basis of the frame of reference, and also three stars. The navigator draws a line from each star to the center of the sun. His fourth line is from the ship's position to the sun, and he determines this by measuring the angles from the other three lines. So far, all he knows is that the ship lies somewhere along this fourth line. Now he measures the apparent diameter of the sun, and he can determine his distance from it, thus completely fixing his position. The only remaining fact he needs is his speed and he can determine this, once again, by the Doppler effect, which causes the shift of certain components of the stars' light.

Computers Calculate Errors

So far we have been concerned with the precise position of the ship in space, its speed and course. Now that we have this information, what do we do with it? We feed it into computers to calculate whether there are any errors in the "orbit" or course of the ship and, if so, what corrections we must make.

Now we transmit these corrections to the ship for action. But here we face even further difficulties. We can't turn the ship like we do an airplane, simply because there is no air to act upon control surfaces. We can alter direction only by firing side rockets. We can alter speed only by firing tail or nose rockets. In Figure 4 the ship is proceeding along its course as indicated. A correction must be made, so a side rocket is fired. The new course of the ship is indicated by the second arrow, and is determined by the amount of thrust imparted by the side rocket.

Solve One Problem, Get Another

But in doing this, still another difficulty arises. How can you impart a precise amount of side thrust when the ship itself may be moving backward, sideways or even tumbling and spinning along its course? Obviously to perform any correction you must first straighten out the ship along the ship-radar line of sight.

Again there are numerous ways we can solve the problem. One rather simple method is to use the radar pulse itself. If you dip your finger in a tub of water, you cause circular ripples to expand outward across the two-dimensional surface. Similarly, if you send a radar wave through three-dimensional space, the wave travels outward in an ever-expanding sphere. Figure 5 shows how we can take advantage

(Continued to page 236)

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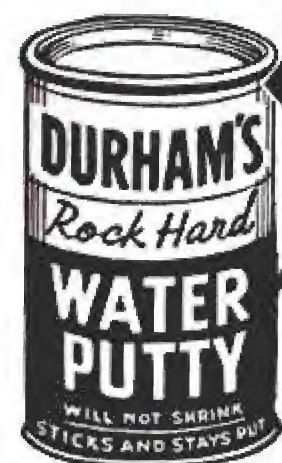
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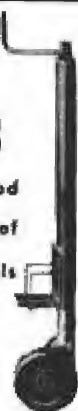
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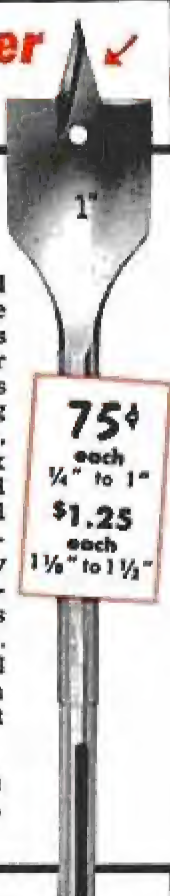
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of this. We mount four different antennas, which pick up the signals in phase, on the rear of the ship. When all four are equal, the ship is oriented on a direct line from the radar. If the phases are unequal, the ship can be straightened out by spinning masses, much like flywheels, inside the vessel.

Next the ship is rotated around its axis to bring the correcting side rocket into the proper position. Then the rocket is fired for the proper length of time. Subsequently other checks of the ship's position and trajectory must be made, and other corrections ordered if necessary, throughout the trip.

Delayed Phone Calls

One of the big difficulties of such trips will be the effect of the enormous distances on communications. You can't pick up a radio telephone, say "Hello," and expect to get a prompt answer. Radio waves travel at a speed of 186,000 miles per second. Even at this speed, communicating with a spaceship in an orbit around Mars will be time consuming. For example, when Mars is at its closest approach to earth, it will still take a good 4 1/2 minutes for a message to be received after it has been transmitted. Obviously there seems little point in a telephone conversation in which the initial "Hello" is answered nine minutes or even nine hours later. It is a fair bet that interplanetary messages will be telegraphic rather than voice, and that great emphasis will be placed on condensing the "message" into as few words as possible.

It is obvious that great problems must be overcome if we are not only to "reach for the stars" but actually reach them—or at least the planets in our own solar system. But it is equally obvious that answers exist to each of these problems.

There is little doubt in my mind that man, now that he has succeeded in attaining escape velocities with his rockets, will himself escape from his mother planet and, using the immutable forces of nature to control and guide him, set off to explore his solar system. ★ ★ ★

Mechanized Cheese Plant Uses Fast Cheddar Process

Australian scientists have developed a completely mechanized system for producing cheddar cheese. The pilot plant, which can handle about 3000 gallons of milk a day, uses a high-temperature process that cuts curd-fusing time from 90 minutes to 30 minutes.



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YOU'LL START AND YOU'LL GO!**

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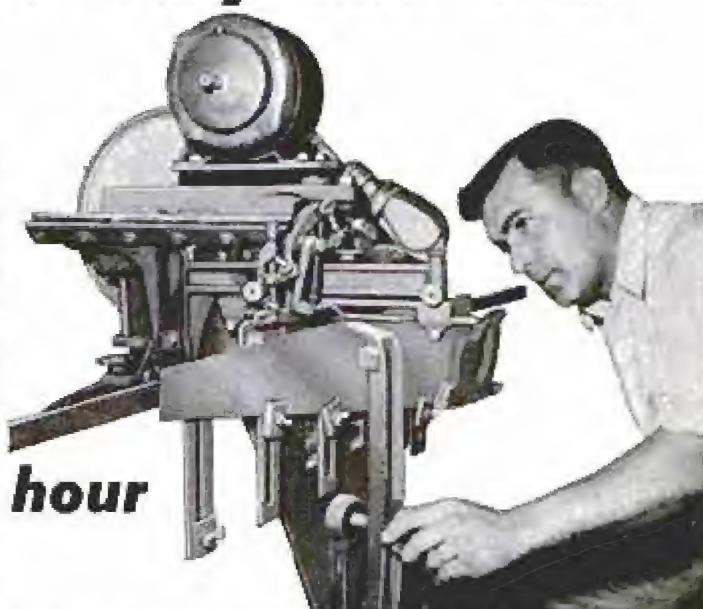


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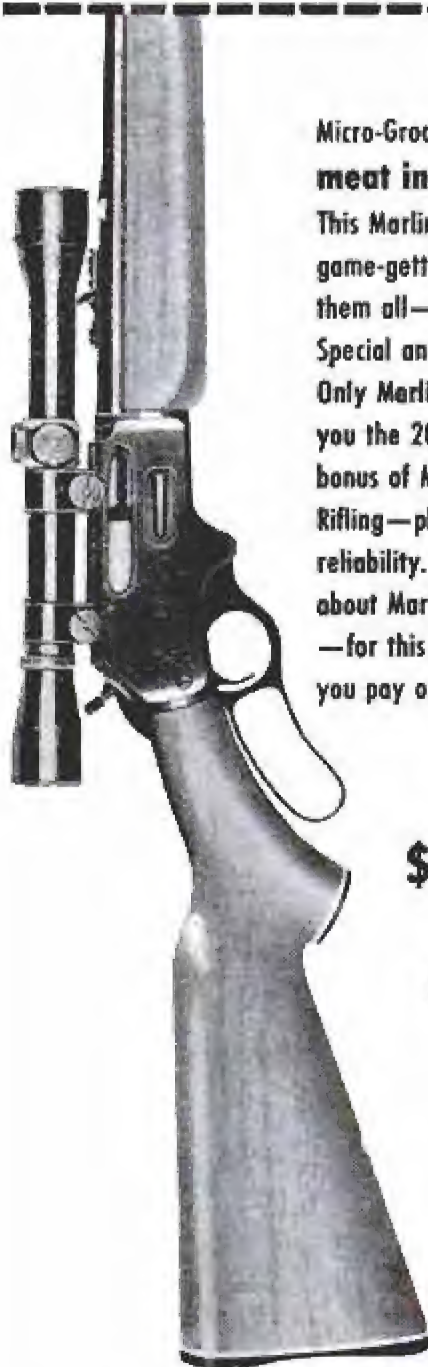
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* Patent applied for.

**Retail price \$78.95 does not include scope. Prices slightly higher west of the Rockies—subject to change without notice. Also available in Canada.

Everybody Is an Inventor

(Continued from page 103)

he'll get right to work. He learned how in school. But if you ask him to devise a way to keep air circulating in a refrigerator, he'll come back in a day or so asking, "How do you mean? With a fan?"

Purdy shrugged. "And we don't know how we mean. We hired him to tell us."

Part of this hesitancy to step over the frontier of facts and to do a little exploring can be chalked up to fear of making mistakes. Teachers and most employers take a dim view of repeated errors, but any inventor will tell you he is wrong 100 times for every time he clicks. That's the only way he can come up with anything new. But fear of failing isn't the only block to invention. Many youngsters seem unwilling to show what they can do—or unaware that they can do it.

Inquiring Spirit Being Lost

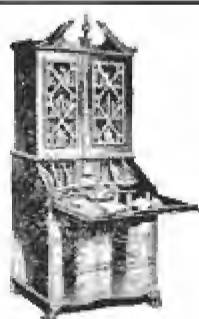
Somewhere along the line so much of the inquiring spirit in American youth has been drowned that both government and industry have been forced to run employees through "creativity seminars" now and then. These courses are little more than pep rallies, designed to convince lazy thinkers that they were born with imaginations after all.

If I have suggested in this article that I do not believe in the efficacy of higher education, I have been misleading. It is unlikely that you can conjure with atoms until you have studied advanced nuclear physics. But the lack of formal education need not be a barrier to one's creative impulses. The fuel of creative intelligence is knowledge, which may be acquired in many ways—through formal education, listening to well-informed persons, through experiment and reading. There is always a library just around the corner.

The chairman of our council, Dr. Charles F. Kettering, of General Motors Corporation, once observed that "inventing is a combination of brains and materials. The more brains you use, the less material you need." ★ ★ ★

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The CAMP COMPANY, Inc. Dept. PM-9
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These Rocketeers Play Safe

(Continued from page 77)

to the lower desert floor on the other. A 10-foot launching stand and an even more elaborate static-test stand have been set up in the center of the site. The launcher, constructed of heavy-grade steel tubing, pivots on a concrete base and can be adjusted to varying angles. By changing the "pitch" of the launcher, and computing expected thrust of a rocket and its fuel, the landing area of a missile can be pinpointed to within a few feet.

But because a rocket upon launching can suddenly become a wild, uncontrollable weapon, due to wind drift, uneven fuel charge or for many other reasons, additional protective steps are taken.

Spectators are confined to slit trenches, fronted by earth mounds. Actual triggering is done by remote control from a concrete blockhouse 60 feet away. A system of green, yellow and red flags—visible anywhere in the firing area—signifies whether a rocket is fueled, armed or in storage.

Visitors Given Instruction

Visitors to the area are given detailed instruction sheets and must sign waivers of liability. A strict firing procedure goes into operation 15 minutes before a rocket is triggered, ending with a siren's wail and a 10-second countdown.

Only at the conclusion of a day's firing, when rockets have been retrieved and volatile materials locked up, are spectators permitted in the rocket compound area to inspect the amateur missiles, take pictures and ask questions.

The average RRS rocket is three to four feet long, constructed of steel or aluminum tubing 2½ to 3 inches in diameter and carrying either three or four fins. Most nose cones are machined steel, although some made of cork or other experimental materials have worked successfully.

The average rocket, powered with a properly tamped fuel, propels itself to an altitude of between 2000 and 5000 feet. Highest altitude an RRS missile has reached is approximately 20,000 feet and the record for amateurs, set a year ago by a group in Inglewood, Calif., is 22,500 feet.

Tamping Fuel Is a Skill

Though solid propellants are actually rapid-burning fuels, they appear to be explosive. Packed too loosely in a rocket shell, they fizzle. Tamped too tightly, they explode. Finding the right firmness between these extremes is a skill which RRS members strive for.

(Continued to page 242)



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PRESIDENT, PETERSEN MFG. CO.



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NOTE: Decision of judges is final. Winners announced on request. All entries become property of Petersen Mfg. Co., Inc. In event of tie, full amount of prize tied for will be awarded each tying contestant. This contest open only to residents of U.S.A. and territorial possessions. Subject to federal, state and local regulations.

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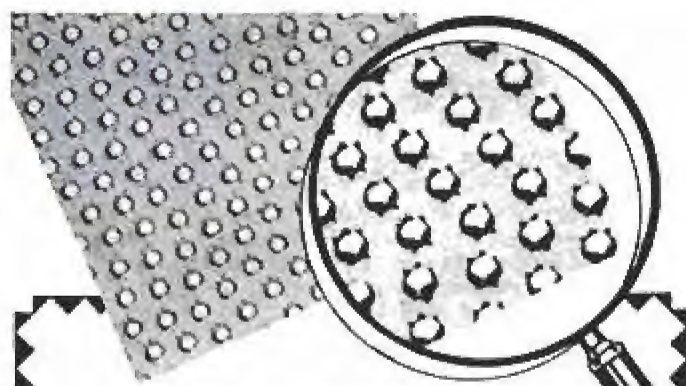
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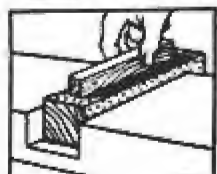
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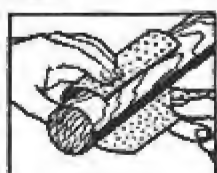
Not one of St. George's souvenirs, but an amazing new cutting tool. A "steel sandpaper" that sands, rasps, smooths.



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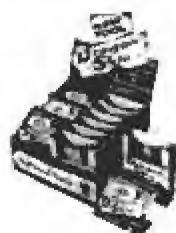
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Sometimes the work is in vain.

At a recent Mojave RRS launching, the most elaborate homemade missile of the day was a 16-foot, three-stage affair carrying a miniature camera and a parachute. Its builder spent more than two months in planning and building.

In less than 17 seconds, the rocket smashed into oblivion when the parachute failed to open and the rig crashed into the desert soil at more than 500 miles per hour.

Most of the RRS rockets are recoverable, and the total losses are rare. Tracking teams stationed in trenches around the impact area follow the airborne missile with special instruments which automatically record its compass bearing upon landing. The rocket can be located by triangulation.

Whether the RRS and its sister societies can maintain their excellent safety record depends, of course, on enforcement of its safety rules.

Some rocket experts, such as Capt. Robert C. Truax, of the Department of Defense's Advance Research Project Agency, think such precautions are adequate but recommend even safer rockets in the hands of amateurs. Truax, in fact, has designed a steam-propelled rocket which he says would be safer.

Equipped with a safety valve, Truax's missile is capable of hurling itself to altitudes of more than 10 miles—more than five times the present amateur record.

While the RRS hasn't yet tried steam, it's hard to predict what may be on the drawing boards of its young members. Meanwhile, it's a job of experiment and fail, try again and succeed.

Successes and Fizzles

On a typical RRS launching day, only about half of the 10 to 15 missiles launched can be rated as complete successes. Some smoke awkwardly on the launching pad. Others fizzle a few feet from the stand and occasionally one explodes in mid-air.

But if only one goes off perfectly all day—and it's a rare occasion when the record is that bad—the young scientists of the RRS are happy.

Parents and friends, watching from the protective cover of slit trenches and barricades a thousand feet away, get a kick out of it, too!

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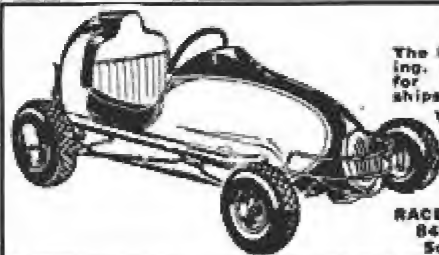


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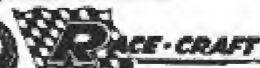
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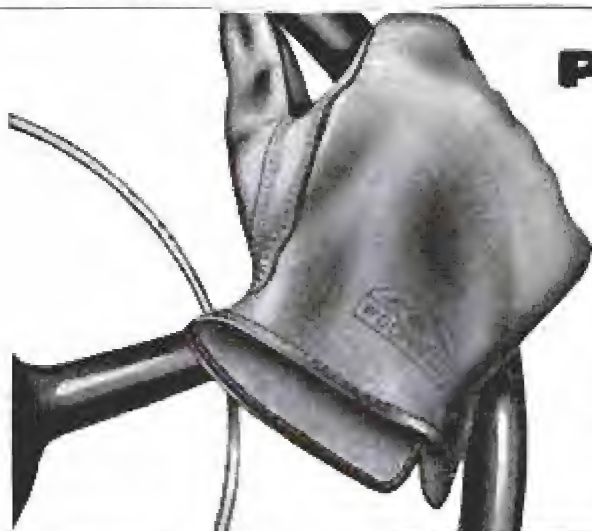
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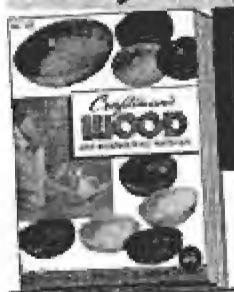
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The 1901 Olds Is Booming

(Continued from page 95)

wheels (20 x 2½ tires) employs ball bearings that need never be lubricated.

Sealed-beam electric headlamps, and the taillight are accurately modeled after the original kerosene lights. And the manufacturer claims 100 miles to the gallon gas economy.

Starts was driving his quaint gas buggy on Fort Lauderdale beach one day when he spotted a man ogling it. The man seemed a likely prospect, so Starts pulled to a halt at the curb before him.

Has Real Pickup

After enumerating the finer points of his handmade car, Starts concluded daringly with, "... And it's got more 'pickup' than the most expensive modern car. I mean girl pickup. No female can resist, should you offer her a ride."

The man didn't seem impressed, so Starts pointed to a pretty girl approaching a block away. "You want me to show you how it works?" he challenged.

The man nodded.

Starts putt-putted off, slid his Merry Olds to a halt beside the surprised girl. Smiling, he asked courteously if she liked his little car. She did; she thought it was "cute." Would she care to go for a ride—just once around the block? She smiled and agreed.

The ride over, Starts stopped with the girl before the man at the curb. "You see how easy it is?" he asked. He turned to the girl. Had she enjoyed the ride? Yes. Had she ever seen him before? No. Would she have gone riding with the man at the curb, had he been the driver?

She laughed. "Yes—he's my husband."

Are There Millions Of Inhabited Planets?

At least a hundred million planetary systems in the universe are capable of supporting life. That is the conclusion of Dr. Harlow Shapley, retired director of Harvard College Observatory in his book, *Of Stars and Man*. The earth's sun is quite an ordinary star, and there are more than one hundred thousand million billion stars throughout the universe. Life could occur wherever a planet was located the right distance from one of these stars to provide the water and warmth that living organisms require. Thus other planets are likely to be inhabited by living, thinking beings equal or superior to man, Dr. Shapley concludes.

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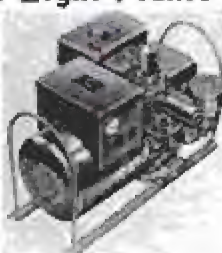
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Vauxhall Owners Praise Handling and Economy

(Continued from page 86)

The British have a word for the type of design he's talking about: Brummagem.

Depreciation costs can really kick you in the wallet. On many domestic cars it amounts to over \$20 a week, while the gas bill is a piddling \$4 a week. Obviously, it's not enough merely to save money on gasoline.

Ride is good. Driver's seat doesn't seem to fit properly, however. Rear-seat ride and rebound control are good also.

Trunk is more than adequate for most requirements. Of course, some people insist on taking everything they own on vacation trips. No trunk is big enough for this type.

It is 167 inches long or 3½ feet shorter than the 1958 Chevy. It's more than a foot narrower as well.

Glass is plentiful, vision excellent. Rear-view mirror is too small, its field of view too restricted. One of the few imports with a wrap-around windshield—the Detroit influence.

→ "Manufacturers have entirely overlooked the fact that there are still some conservative people in the U.S.A. who like moderate cars that do not look like circus wagons."—Tennessee retired owner.

"Competition in American cars for excessive horsepower and extreme length may appeal to the ego, but the average driver is not physically, emotionally or psychologically equipped to handle the power sensibly."—Massachusetts banker.

→ "The high rate of depreciation is my biggest complaint about American cars—in other words, economy."—Oregon clergyman.

"One main reason I bought a foreign car is that I am tired of American manufacturers' claims about each car being cheapest in the low-price bracket. These cars lose almost a third of their value in the first year. These so-called American economy cars are keeping the gas and oil companies rich."—Illinois diesel mechanic.

More Best-Liked Features

The following quotations describe, in order of frequency of mention, additional best-liked features:

→ "Rides well. Takes the bumps without jarring the passengers."—Wisconsin physician.

"American cars have a hump in front and rear so can only seat four comfortably. The Vauxhall is roomy for four persons and has a good ride for a small car."—Indiana powerhouse operator.

"Parking in town is no problem at all."—Illinois miner.

"It fits the garage. Easy to park."—New York bookkeeper.

→ "It isn't small or large, but medium size. On a trip there is plenty of room for luggage in the trunk, and ample room for two adults and three children. We will not go back to a larger car."—Pennsylvania manufacturer.

"Just finished a 1300-mile trip through desert, mountains and cities. Averaged 28.9 miles per gallon, cruising between 65 and 70. Experienced no driver fatigue at all. Engine temperature below normal even though outside air was 105 degrees. Burned no oil. In my American car last year on same trip I burned three quarts of oil, boiled over twice and averaged 16 miles per gallon while traveling at same speeds."—Arizona auto mechanic.

"I may not be typical, but I just returned from a trip of over 300 miles and my Vauxhall breezed along with the best of them and a lot more cheaply."—New Jersey mayor.

"At first I thought perhaps it wasn't quite powerful enough. However, after adjustments to timing, carburetor, and adjusting myself to its capabilities, I find it very responsive and a delight to drive."—Pennsylvania owner.

→ "I like its size. I have a regular-size two-car garage. With one small car and one big car in it, there is about four extra feet for storage."—Indiana dentist.

"I am a woman, only 5 feet tall, weigh 98 pounds. I like its size. Also we have a narrow driveway that can be enlarged only at great cost."—Ohio housewife.

→ "Back window is large enough so you can see both fenders. I like the wrap-around windshield too."—Ohio barber.

"Much better road vision."—Illinois principal.

"Has a good-size trunk."—Maryland foreman.

"I go over a very rough road every day and I haven't a

(Continued to page 248)

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EXCLUSIVE!

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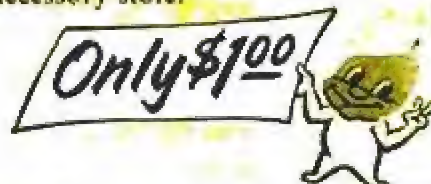
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**Toolkit, what's that?
With an American car,
you're lucky to get
a jack handle.**

**Shifting is laborious.
Another case of taking
the long way around.
The shift lever should
be on the floor so its
action is direct, effortless.
A backward step? Perhaps.
But progress nonetheless.**

**Compression ratio is
7.8 to 1. No need for
high-test gas here.
Car simply needs its
timing reset.**

**Vauxhall is very, very
British. It lacks the
great-to-be-alive feeling
of continental small cars.
Solid but stodgy, sort of
old-maidish. Could stand
a little crossbreeding
with the sporty type.
Brakes are excellent.
Clutch pedal is hydraulic,
but heavy nonetheless.
Would be improved by a
four-speed transmission for
traffic flexibility, although
it lugs well in high.
Instruments clear and
accurate. Glovebox is
elbow-deep. Rear-seat
legroom restricted. Rear-
wheel traction suffers on
washboard corners.**

rattle or squeak any place on the car. They are very well made."—California warehouseman.

"I like its standard shift pattern."—New York teacher.

"Has a good heating system."—Pennsylvania trainman.

"Average owner can make most minor repairs and adjustments himself. Excellent luggage space for a small car."—Illinois superintendent.

→ "Owner's manual is clearly written even with the English phrasing. I like the little toolkit and the can of touch-up paint."—Missouri gauge maker.

And Additional Complaints

Fourth on the list of complaints is the difficulty of shifting, say Vauxhall owners. Here, in order of frequency of mention, are quotations on this and other complaints:

→ "My main complaint is that the gearshift seems rather tight. It's hard to shift some of the time."—Ohio nurse.

"Back cushion of the front seat is not too comfortable."—New Jersey sales supervisor.

"Both my wife and I get a cramp in the hip after driving. The front seat should be changed."—Florida repairman.

"I have talked to six Pontiac-Vauxhall dealers and none could give trained service."—Ohio office manager.

"Gas mileage is not what we were told we would get. The salesman guaranteed us 30 miles per gallon. We get 24 to 26."—Vermont secretary.

"My monthly gas bill is \$16. It used to be \$28 with my American V8. But this may not be much gain when maintenance is considered. An oil-filter element for the American car is 98 cents, for the Vauxhall it's \$3.15."—Michigan mechanical engineer.

→ "Tappets a bit noisy. Spark knock is very bad unless high-test gas is used."—Virginia owner.

"During a trip to New Mexico a noise developed and we were told it was the result of a faulty ring-and-pinion gear in the rear end. They did not have replacements available. The car was out of service for six weeks while parts were obtained."—Illinois housewife.

"Differential has a howl in it. I have waited for two months for parts."—California merchant.

"Unit body has not eliminated rattles to the extent I had expected."—Texas engineer.

"Oil consumption is high because of a leaking oil seal at the rear bearing."—New York designer.

"Oil sprays over the engine from breather cap. Uses about a quart in 1000 miles."—Pennsylvania owner.

"Wipers give trouble. At first they moved so fast they didn't even touch the glass. Now they don't work at all."—Massachusetts foundry worker.

"Steering remains stiff after almost 5000 miles."—Missouri salesman.

"Company says to use regular gas. But I have to use very high-octane gas to get good results."—Indiana nurse.

"Taillight and reflector are too far out. They have both been broken twice. Bumper doesn't protect them."—Illinois teacher.

"The heater should be moved under the hood."—New Mexico air force member.

"My wife says it is hard to clean the floor because it is sunk down."—Vermont customs inspector.

There you have it—the good and bad points about the 1958 Vauxhall as described by the owners themselves in our coast-to-coast survey. For an engineer's story on the car, turn to page 84. ★ ★ ★

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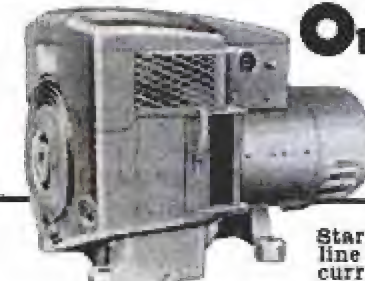
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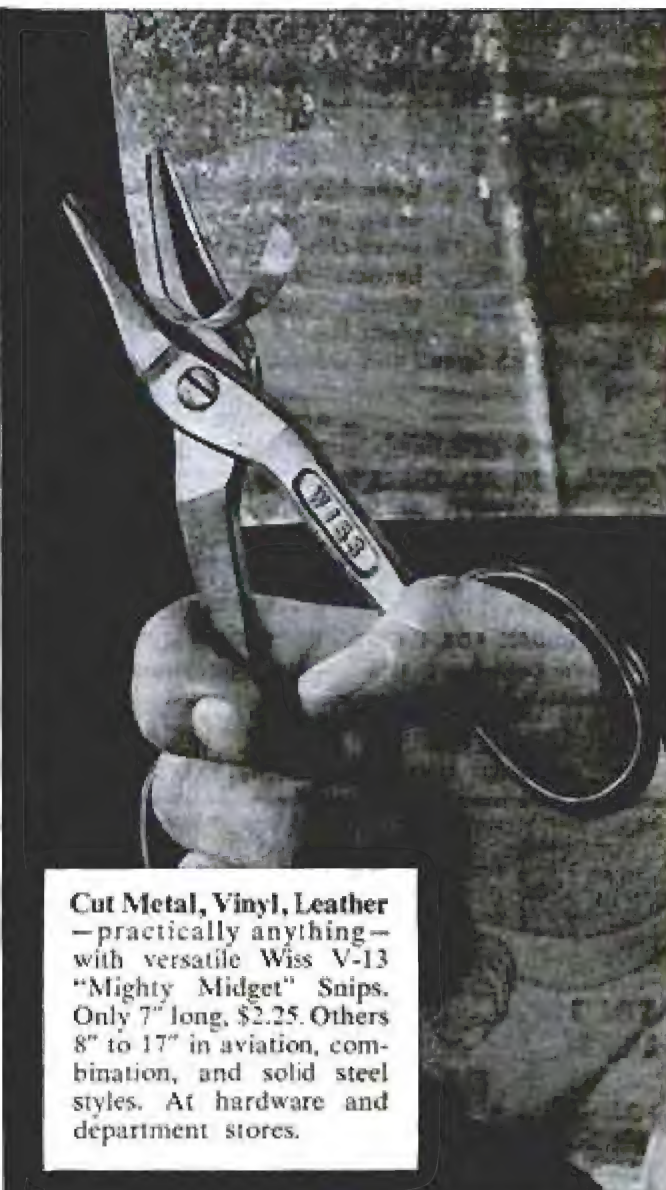
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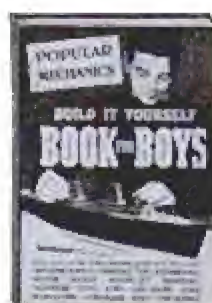
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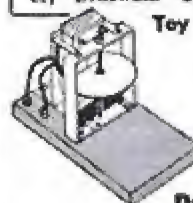
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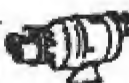
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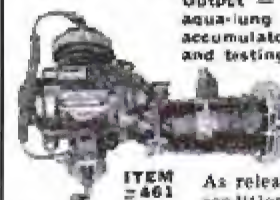
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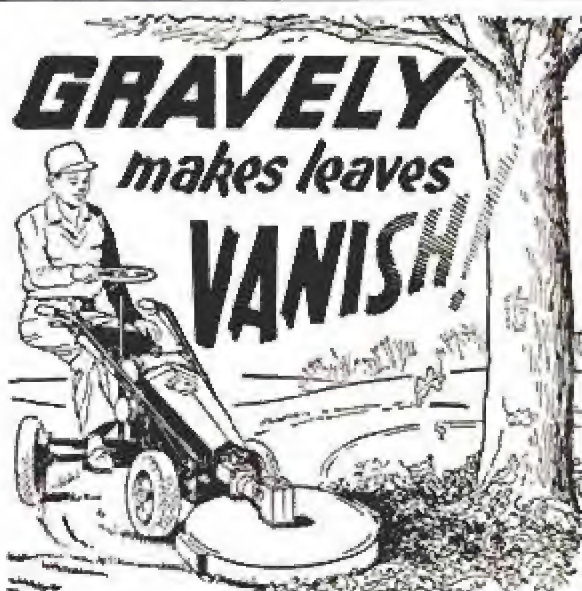
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**Flash Holder Provides Own Power
With Built-in Generator**

Camera owners can now buy a compact flash holder that provides its own power. The flash holder has a built-in generator that fires the lamp. A half turn of a nylon handwheel stores enough electricity in a capacitor to fire any one of the popular M-2, No. 5 or M-25 flash bulbs.

Ⓢ Potash added to the diet of carnations causes them to perk up and sell for more.

SPECIAL FALL HYDRAULIC SALE SAVE UP TO 85% TODAY



No. H-24D - Double Action Cyl.
2000 PSI Steel barrel. Ideal for hydraulic press work. Has 2-1/2" bore, 7" stroke, 1-5/8" shaft, 19" length.

Approx. Gov't Cost . . . \$270.00
Palley Cat. Price \$12.75

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No. H-56 - 1500 PSI CYL.
Parts are so arranged to allow these cylinders to be used singly or in series. Ideal for production line equip. Bore 1 1/2", shaft is 1-1/8", stroke 4-7/8".

Approx. Gov't Cost . . . \$70
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2.95



H-14 SALE NOW 7.95

1500 PSI Double Action HYDRAULIC CYLINDER - Has bore of 1-3/8" Shaft 1" diameter, Stroke 15-5/8", O/A lgth. 22". Cost Gov't approx. \$90.2



No. H-35 - For long stroke operation up to 1500 PSI. Stroke is 26-3/8", Bore 1 1/2", Shaft 1", Length 32-3/4". Cost Gov't approx. \$116. Cat. Price \$16.50

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4-WAY VALVE

Made to rigid Gov't specs. Poppet type. Spring loaded. Pressure balanced. Valve is closed in neutral. Has 1/4" internal tube ports. **SAVE!**

Gov't Cost approximately \$30.00
Regular Palley Catalog Price \$6.75

3.95

SPECIAL HP-3



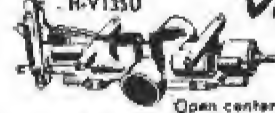
HYDRAULIC HAND PUMP

Reg. Palley PRICE 17.50

Operates at 1500 PSI. Displaces 0.19 GPM at 30 cycles per minute. Capacity 1.5 cubic inches per cycle. Has built-in check valve. Cost gov't approx. \$80.00

ONLY 6.95

SPECIAL 4-WAY HYDRAULIC VALVE



7.88

Open center in neutral. Piston type with built-in relief valve. 5/8" AC tube ports. Another Surplus Bargain. Reg. Cat. price \$12.75.

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For use where tremendous power at a low take-off speed is desired. Drives thru a train of 6 gears rotating on self-lubricating, hi-speed roller bearings. Take-off shafts are 1 1/4" and 3/8".

NEW! excellent condition **8.95**

5.95 USED



4-SPEED HOBBY MOTOR

A rugged, precision built electric motor for use on Barbecue, in home workshop, etc. Uses 110 volt, 60 cycle current. Has four take-off shafts turning at separate speeds of - 5, 25, 150 and 4000 RPM. **SAVE!**

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HIGH TORQUE HYDRAULIC MOTORS

62.50 EACH

HMP-108 - Gear type. Displaces 6 cu. inches per rev. Capacity 16 GPM at 1000 PSI or 600 RPM. 3/4" shaft.

HMP-10C - Gear type, low speed. 12 cu. in. displacement per rev. Capacity: 16 GPM at 300 RPM at 1000 PSI. Shaft diameter is 3/4".



MOTOR DRIVEN GEAR PUMP

Has a capacity of 4.5 GPM at 2300 RPM or 1000 PSI. Integral by-pass valve returns oil to input side of pump at 1200 PSI. Has intermittent duty, 3.75 HP motor - 24 VDC, 250 amps at 2300 RPM. **29.95**



SPECIAL R-1 GENERATOR

Gov't cost approx. \$200
Palley Reg. Price \$27.95

Gov't Surplus Bargain. Designed for use on Aircraft but easy to convert for use as Arc Welder, battery charging and electro plating. Compound wound for heavy duty use. Rated 300 Amps. 24-32 Volt D.C. Has an RPM of 3750 to 4000. Rotation is counterclockwise. 3/4" spline shaft. Made by General Electric.

NOTE: Conversion instructions to make Arc Welder are FREE on request!

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WELDING REACTOR - Has iron core wound with No. 4 wire. Will stand load of 400 Amps. Use with generators shown here **ONLY 10.95**



THROTTLE CONTROL SOLENOID - Use as welder or motor control. Has 5" shaft, 1" travel. Specially priced **7.95**



"V" BELT PULLEY ADAPTER to adapt V-Belts to use on generators. . . . \$27.50
24 Volt RHEOSTAT for use as welder output control. 5 variable outputs. Only \$2.95

04 TYPE GENERATOR



Another fabulous Gov't Surplus Buy! Designed for use on military aircraft. Compound wound. Adaptable for portable light and power plants or as a power supply for boats. Rated at 100 Amps, 24 V DC. Operating speed 5000 to 10,000 RPM. **14.95**



STEEL AIR TANKS

Pressure tested to 400 PSI. Originally used as oxygen tanks. Have ports in both ends topped for 1/4" std. pipe thread. Capacity 500 cu. in. Size: 6-1/2" x 24".

No. D2-C Carbon Steel . . . **NEW 5.95 USED 4.95**

No. D2-S Stainless Steel **9.95**

F-2 STEEL TANKS - Same as above except 1000 cu. inch capacity. Size: 6" x 45".

No. F-2C Carbon Steel \$6.95 F-2S Stainless . . \$10.95



LARGE VOLUME AIR or CHEMICAL STORAGE TANKS

Pressure tested to 400 PSI. Has 18,000 cubic inch capacity (77 gallons). Of stainless steel construction. Size: 24" diam. x 45" lgth. Worth \$150 . . . **NOW ONLY 99.50**

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Stainless Steel G-1 Type AIR TANKS

Pressure tested to 400 PSI. Ideal for air, acids, chemicals, experimental uses, etc. Has 1/4" pipe ports. Size: 12-1/2" x 24" long. **12.95**
No. G-1U - Used
No. G-1N - NEW . . . \$16.95



CENTRIFUGAL WATER PUMP

Ideal for draining basements, pumps, flooded areas. Must be primed. Has brass body and rotor. Stainless steel shaft. Bearing mounted. 1-1/2" pipe thread inlet, 1-3/4" hose outlet. Delivers 6000 GPH at 1 ft. head at 1800 RPM with a 1/3 HP motor. . . .

MOUNT BASE for above pump \$4.25
1-1/4" Bronze Foot VALVE for above pump to hold prime & filter. . . \$3.98

19.95



2500 lb. BOMB HOIST

ONLY 29.95 Ideal for garage, boat, jeep, truck, shop, etc. Has bronze worm gear drive with 24 to 1 ratio and 3-speed crank. Comes with 18 ft. of 3/16" high tensile steel cable and crank, and freewheel, pull-out clutch. . .

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HYDRAULIC REMOTE CONTROL MASTER & SLAVE



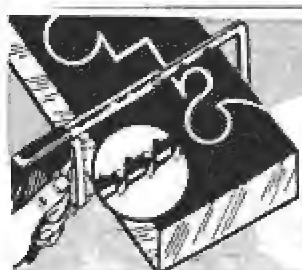
When connected with 1/4" tubing and filled with oil they act as a precision, remote power transmission unit. Moving Master handle causes Slave arm to respond in exact motion from 0 to 90°. Ideal for remote machinery controls, etc.

No. H-FX-1811 **NOW 27.50**
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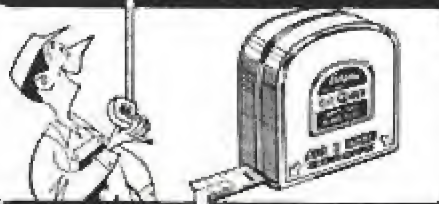


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ONLY
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IT STANDS UP STRAIGHT
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Long upright measuring jobs are easy with Evans King Size. Blade is a full $\frac{3}{4}$ " wide... 33% wider than ordinary tapes. Stands straight up or lays down flat - won't bend or buckle. Easier to read, too. Free belt clip, Tenite utility case. Sliding end hook - for 100% accurate inside-outside measuring.

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Through sensitive earphones, technicians listen to the high-speed whine of tires that haven't been made yet. Crayon markings on a whirling Lucite disk simulate the tread design of hypothetical tires. The disk rotates between a photocell and a light beam that is interrupted by the marks. The photocell actuates a generator, and the machine produces the electrical equivalent of the noise a tire with this tread pattern would make on a smooth road.



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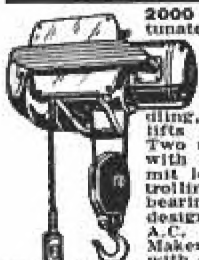
AMERICA'S BEST JET STEAM MASTER

Now, a super efficient portable steam generator that produces live steam at 100 lbs. pressure in 60 seconds from a cold start! Produces large volume of high pressure steam on 2 pints of fuel oil. Instantly cleans sticky grease, dirt, rust, old paint, etc. off implements and food machinery. Pays for itself in a few weeks. Sterilizes, sanitizes, shines as it cleans—milk equipment, etc. Fully automatic—oil fired with new, built-in lifetime bronze water circulating pump. Draws water from faucet or bucket. Simple and safe—anyone can use it; built-in safety valve. Complete with 12 ft. of hi-pressure steam hose and new triple efficiency steam gun that automatically mixes in soap solution if desired. Wt. 250 lbs. Item 443. **\$349.50** Special factory price.



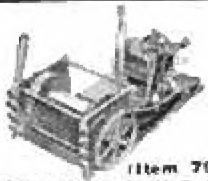
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2000 lb. CAPACITY. A fortunate purchase from the Air Force enables us to offer these powerful 2000 lb. electric cable hoists at a fraction of their value. Perfect for material handling, boat hoists, elevators, lifts on assembly lines, etc. Two separate 22 ft. lift cables with independent controls permit leveling the load and controlling it perfectly. Rugged ball bearing motors of geared down design 110 volts. Available for A.C. or D.C. Please specify. Makes a terrific portable hoist with our #273 D.C. light plant at \$49.75. Offered at less than 33% of regular cost (hook not included). Wt. 145 lbs. A.C. Model, item 847A. **\$149.50** D.C. Model, item 847. **\$129.50**



Rugged, ball bearing WINCH

Sturdy ball bearing winch—super tough aluminum alloy construction. Powered by an easy starting 2 1/2 HP Briggs gas engine thru gear reduction drive—it exerts up to 3000 lbs. of terrific force for hoisting materials or pulling. Combination gear and pulley reduction results in tremendous multiplication of engine power, later pulley clutch arrangement and built-in drum brake (with ratchet hand lever) enables operator to ease loads down gently and lock at any point desired. Drum handles 400 ft. of 3/4" cable or 600 ft. of 1/2" cable. Ideal for contractors, farm implement trailers and unlimited other uses! (Item 795) Wt. 125 lbs. Only **\$149.50** **HAND WINCH**—Same winch with large crank handle for extra leverage and 2 speed drive. (Item 794) Wt. 60 lbs. **\$59.50**



Variable Speed Selector

Heavy duty, made by E. F. GOODRICH for industrial use. Provides instant speed changes for any drive. For machine tools, dryers, printing, conveyors, production lines, hoists—any operation requiring variable speed. Employs reliable "trouble free" planetary system. No hydraulic power losses. Infinite range, smooth operation, easy installation. 3 sizes: 1 1/2 hp., 3 hp., 5 hp.; 1 1/2 hp., wt. 55 lbs.; 3 hp., wt. 105 lbs.; Reg. list \$228, \$252 and \$352. Our prices **\$79.50, \$89.50 and \$114.50**



HEATING & VENTILATING FAN

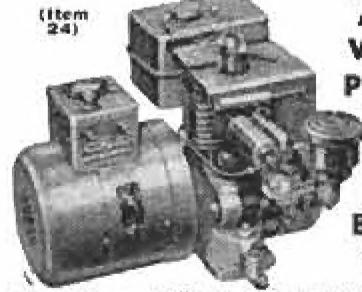
Item 101! Easily installed in furnace pipes. Forces even heat to all rooms. Over range removes kitchen smoke and odors. Powerful, continuous duty motor, 110-120v. AC. Mount in wall or ceiling to ventilate any area. Quiet, super-efficient fan moves huge volume of air. (400 to 600 CFM.) 8" Pipe, wt. 5 lb. **\$6.85** 9" Pipe, wt. 6 lb. **\$7.85** 10" Pipe, wt. 7 lb. **\$8.85** 12" Pipe, wt. 8 lb. **\$9.85** **HEAVY DUTY FAN.** Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 102). **\$11.95** 12" Fan, wt. 10 lbs. (Item 103). **\$12.95** **HIGH SPEED BARN FAN** similar to above, but larger, high speed motor moves huge volume of air. 14" Fan (Item 104). **\$14.95** 16" Fan (Item 105). **\$17.95**



MASTER MECHANIC'S BEDROCK FACTORY PRICES

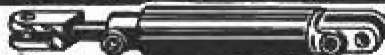
700 WATT PLANT

PUSH BUTTON START



115 v. 60 cyc. AC Powered by a rugged 2.2 HP. easy starting Briggs engine. No wiring necessary; just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 watts. Ideal for television and radios. Complete with voltmeter and built-in winding to charge 6 v. auto batteries. (Item 24) Wt. 75 lbs. Easily fits in car trunk. Be prepared if storm knocks out power lines. **\$143.50** Regular \$275.00 value. **\$199.50** 1200 Watt Plant (Item 43) same as Item 24 but larger generator and engine with 50% greater output. We make every type and size of light plants. — Write giving us your requirements!

Double Acting Hydraulic Cylinder

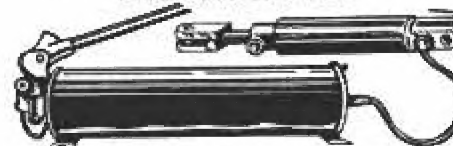


A powerful cylinder mfr'd. by Massey Harris which develops both a pushing and a pulling action. Will push 8,100 lbs., with a 1000 PSI pump pressure. Cylinder is 3 1/2" O.D. with 6 1/2" stroke—standard heavy duty clevises on both ends. Has standard 1 1/2" pipe thread openings. Can be used for tilting buckets or blades, raising or lowering implements, hydraulic presses, etc. Can also be used as an air cylinder. (Item 802) Wt. 17 lbs. Reg. \$68 value. Special. **\$14.95**

OTHER DOUBLE ACTING CYLINDERS	
6" stroke — 1 1/2" bore.....	\$ 8.95
8" stroke — 3" bore.....	34.00
10" stroke — 3" bore.....	34.80
16" stroke — 3" bore.....	43.00
24" stroke — 3" bore.....	47.50
42" stroke — 5" bore.....	75.00
60" stroke — 5" bore.....	125.00

We have all sizes of cylinders available. **HYDRAULIC CONTROL VALVE** — 4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equalizing feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet, — on cylinder outlets. Easily mounted, finger tip control. Wt. 16 lbs. (Item 822). **\$21.95**

HYDRAULIC KIT



Complete Hydraulic Kit consists of hydraulic hand pump with built-in 2 gal. reservoir and item 802 hydraulic cylinder described above. Pump has a built in relief valve and is rated at 10 tons. Kit is ideal for presses, jacks, snow-plovers, etc. Pump is 20" long—6" diam. with 3/4" ports. A terrific value! **\$39.50** (Item 836). Wt. 50 lbs. **\$23.50** Pump only (Item 836a) only. **\$23.50** **HYDRAULIC HOSE COUPLERS** Connect or disconnect hydraulic lines without loss of oil. 1/2" pipe threads. (Item 819) per set **\$3.95**

AIR HAMMER

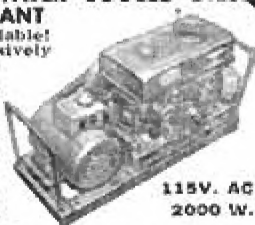
SAME HAMMER, WITHOUT ARM **ORIGINALLY** designed to hammer dents out of auto bodies, fenders, etc. Complete with 2 different shaped arms, a set of 5 bumping bottles, and 20 ft. of heavy duty air hose. Hammer can also be used without arm. Uses 4 CFM at 60-100 PSI. **\$173.00** **SPECIAL \$39.50**



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LIGHTWEIGHT WATER COOLED DIESEL GENERATOR PLANT

Never before available! Now offered exclusively by Master Mechanic. A low priced, lightweight, continuous duty, Diesel generator set. Powered by a super rugged, exceptionally smooth running, one cylinder Diesel engine. Operates at conservative 1750 r.p.m. and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs. Representing a triumph of Diesel Engineering. Complete with fuel filter, oil pressure gauge, control box with duplex receptacles and voltmeter. (Item 830) Special factory price. **\$429.50**



HI-FLO Centrifugal PUMP

Completely self-priming! No foot valve required. Tremendous capacity—100 gal. per min. 1" Special impeller enables pump to handle muddy or sandy water. Simple to operate—simply start engine and watch the water go. Powered by a rugged, easy starting 2 HP Briggs engine. Pre-lubricated sealed bearings for years of heavy low-cost service. **\$134.50** Model, Item 502. Wt. 70 lbs. Factory price. **\$169.50** 2" Model (150 gal. per min.) with 3 1/2 hp. engine. Item 502H—40 lbs. Special. **\$169.50**



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Genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with super tough cotton cord plies—yet completely flexible. Equipped with standard thread male and female fittings. Pump water for irrigation, stock tanks, home, barn, fire fighting, etc.—or pump gas and fuel oil. Volume factory prices—save more than 60%.



Size	Price	Size	Price
1"x10'	5.95	1 1/2"x50'	29.50
1 1/2"x10'	7.95	2"x10'	16.50
1 1/2"x20'	10.95	2"x14'	9.50*
1 1/2"x25'	13.95	2"x18'	21.50
1 1/2"x30'	24.95	2 1/2"x10'	27.50
1 1/2"x100'	49.95	2 1/2"x50'	27.50
1 1/2"x10'	10.95	3"x10'	37.50
1 1/2"x25'	14.75	3"x10'	25.50*
*Discharge Hose		4"x15'	44.95

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1. **MINE DETECTORS:** Used by plumbers, contractors, water dept., etc. for detecting buried metallic or non-metallic objects. Finds buried sewers, water pipes, wires, etc. Complete in carrying case. Batteries \$10.00 extra. **\$39.50** Gov't Cost \$600. Our price.

MASTER D.C. ARC WELDER

Easy To Use Now! a portable, rugged, industrial type welder with terrific performance, yet at a price hundreds of dollars less than you'd expect. Senior model made for years of trouble-free, continuous service. High capacity DC welding unit enables you to tackle any job with confidence—easily welds anything up to 2" plate using from 1/16" to 1/4" rods. Built-in stabilizer and cooling system makes arc easy to strike and hold. Dual control rheostat provides low heat soldering, brazing and welding from 30 to 300 amps. Complete with instructions, guarantee and triple V-belt or flat pulley. Easy to hook up and easy to operate. **WELDER ONLY — DUAL CONTROL MODEL.** Same as above, but drive with your tractor, jeep or gas engine of 14 HP or more. (Item 38a.) Wt. 110 lbs. \$450 value **\$119.50** **WELDER ONLY—INDUSTRIAL MODEL** same as above but with ceramic rotary type rheostat providing 74 different heat settings for all types of welding (Item 38b) **\$500.00 value. \$139.50** **COMPLETE POWER MASTER** (Illustrated above) powered by a 16 hp. air cooled Wisconsin engine. Wt. 480 lbs. (Item 280) Complete with welder costing \$1200. **\$449.50** Factory Special.

WELDING KIT Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at **\$10.50**



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- ☐ Business Administration
- ☐ Business Management
- ☐ Cost Accounting
- ☐ Creative Salesmanship
- ☐ Managing a Small Business
- ☐ Professional Secretary
- ☐ Public Accounting
- ☐ Purchasing Agent
- ☐ Salesmanship
- ☐ Salesmanship and Management
- ☐ Traffic Management

CHEMICAL

- ☐ Analytical Chemistry
- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ Elements of Nuclear Energy
- ☐ General Chemistry
- ☐ Natural Gas Prod. and Trans.
- ☐ Petroleum Prod. and Engr.
- ☐ Professional Engineer (Chem)
- ☐ Pulp and Paper Making

CIVIL ENGINEERING

- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Structural Engineering
- ☐ Surveying and Mapping

DRAFTING

- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Drafting Machine Design
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Sheet Metal Drafting
- ☐ Structural Drafting

ELECTRICAL

- ☐ Electrical Engineering
- ☐ Elec. Engr. Technician
- ☐ Elec. Light and Power
- ☐ Practical Electrician
- ☐ Practical Lineman
- ☐ Professional Engineer (Elec)

HIGH SCHOOL

- ☐ High School Diploma

- ☐ Good English
- ☐ High School Mathematics
- ☐ Short Story Writing

LEADERSHIP

- ☐ Industrial Foremanship
- ☐ Industrial Supervision
- ☐ Personnel-Labor Relations
- ☐ Supervision

MECHANICAL and SHOP

- ☐ Diesel Engines
- ☐ Gas-Elec. Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Metallurgy
- ☐ Industrial Safety
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mech)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design
- ☐ Tool Making

RADIO, TELEVISION

- ☐ General Electronics Tech.

- ☐ Industrial Electronics
- ☐ Practical Radio-TV Eng'g
- ☐ Practical Telephony
- ☐ Radio-TV Servicing

RAILROAD

- ☐ Car Inspector and Air Brake
- ☐ Diesel Electrician
- ☐ Diesel Engr. and Fireman
- ☐ Diesel Locomotive

STEAM and DIESEL POWER

- ☐ Combustion Engineering
- ☐ Power Plant Engineer
- ☐ Stationary Diesel Engr.
- ☐ Stationary Fireman

TEXTILE

- ☐ Carding and Spinning
- ☐ Cotton Manufacture
- ☐ Cotton Warping and Weaving
- ☐ Loom Fixing Technician
- ☐ Textile Designing
- ☐ Textile Finishing & Dyeing
- ☐ Throwing
- ☐ Warping and Weaving
- ☐ Worsted Manufacturing

Name _____ Age _____ Home Address _____
City _____ Zone _____ State _____ Working Hours _____ A.M. to P.M. _____
Occupation _____

Canadian residents send coupon to International Correspondence Schools, Canadian, Ltd., Montreal, Canada. . . . Special tuition rates to members of the U. S. Armed Forces.

To Introduce You to the RCA VICTOR POPULAR ALBUM CLUB

THESE FIVE OR **ANY FIVE** OF THE
24 ALBUMS LISTED BELOW FOR
ONLY \$3⁹⁸ [RETAIL VALUE AS HIGH AS \$24.90]

...if you agree to buy five albums from the Club during
the next twelve months from at least 100 available

THIS exciting new plan, under the direction
of the Book-of-the-Month Club, enables you
to have on tap a variety of popular music for
family fun and happier parties . . . and at an
immense saving. Moreover, once and for all, it
takes bewilderment out of building such a well-
balanced collection. **You pay far less for albums
this way** than if you buy them haphazardly.
For example, the extraordinary introductory
offer described above can represent as much as a
40% saving in your first year of membership.
Thereafter you save almost 33 1/3%. After buy-
ing the five albums called for in this offer, you
will receive a *free* 12-inch 33 1/2 R.P.M. album,
with a nationally advertised price of at least \$3.98,
for every two albums purchased from the Club.
A wide choice of RCA VICTOR albums will be
described each month. One will be singled out as
the *album-of-the-month*. If you want it, you do
nothing; it will come to you automatically. If you
prefer one of the alternates—or *nothing at all in
any month*—you can make your wishes known on
a simple form always provided. You pay the
nationally advertised price—usually \$3.98, at
times \$4.98 (plus a small mailing charge).



ALL ALBUMS ARE
12-INCH 33 1/2 R.P.M.
LONG-PLAYING



**SINGING STARS • BROADWAY MUSICALS • JAZZ
DANCE MUSIC • MOOD MUSIC • COLLECTOR'S ITEMS**

**CHECK THE FIVE ALBUMS YOU WANT
DO NOT DETACH FROM THE COUPON**

- | | |
|--|---|
| <input type="checkbox"/> WE GET LETTERS.....Perry Como | <input type="checkbox"/> FAMILY ALL TOGETHER
Boston Pops |
| <input type="checkbox"/> BELAFONTE | <input type="checkbox"/> PORGY AND BESS...Merrill & Stevens |
| <input type="checkbox"/> FRANKIE CARLE'S SWEETHEARTS | <input type="checkbox"/> MUSIC FOR DINING
Melachrino Orchestra |
| <input type="checkbox"/> NEW GLENN MILLER ORCH. IN HI FI | <input type="checkbox"/> BOUQUET OF BLUES...Dinah Shore |
| <input type="checkbox"/> BRASS AND PERCUSSION
Morton Gould | <input type="checkbox"/> SWEET 17.....Ames Brothers |
| <input type="checkbox"/> JAMAICA.....Original Cast | <input type="checkbox"/> LET'S CHA CHA WITH PUENTE |
| <input type="checkbox"/> STUDENT PRINCE.....Mario Lanza | <input type="checkbox"/> EYES OF LOVE...Hugo Winterhalter |
| <input type="checkbox"/> BING WITH A BEAT...Bing Crosby | <input type="checkbox"/> THINKING OF YOU...Eddie Fisher |
| <input type="checkbox"/> TOWN HALL CONCERT PLUS
Louis Armstrong | <input type="checkbox"/> MOONGLOW.....Artie Shaw |
| <input type="checkbox"/> LET'S DANCE with the THREE SUNS | <input type="checkbox"/> IN A MELLOWTONE...Duke Ellington |
| <input type="checkbox"/> SOUTH PACIFIC
Original Sound Track | <input type="checkbox"/> VICTORY AT SEA...Rodgers' TV Score |
| | <input type="checkbox"/> YES INDEED!.....Tommy Dorsey |
| | <input type="checkbox"/> BLUE STARR.....Kay Starr |

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c/o Book-of-the-Month Club, Inc., 345 Hudson St., N. Y. 14, N. Y.

Please register me as a member of The RCA VICTOR Popular Album Club and
send me the five albums I have checked at left, for which I will pay \$3.98, plus a
small mailing charge. I agree to buy five other albums offered by the Club within
the next twelve months, for each of which I will be billed at the nationally ad-
vertised price: usually \$3.98, occasionally \$4.98 (plus mailing charge). After my
fifth purchase, if I continue, for every two albums I buy I may choose a third
album free. After the first year, I need buy only four albums from the Club in any
twelve-month period to maintain membership. I may cancel my membership any
time after buying five albums from the Club (in addition to those included in this
introductory offer).

Name _____

Address _____

City _____ Zone _____ State _____

NOTE: If you wish to enroll through an authorized RCA VICTOR dealer, fill in here:

Dealer's Name _____

Address _____

PLEASE NOTE: Send no money. A bill will be sent. Albums can be sent
only to residents of the U. S., its territories and Canada. Albums for Can-
adian members are made in Canada and shipped duty-free from Ontario.



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